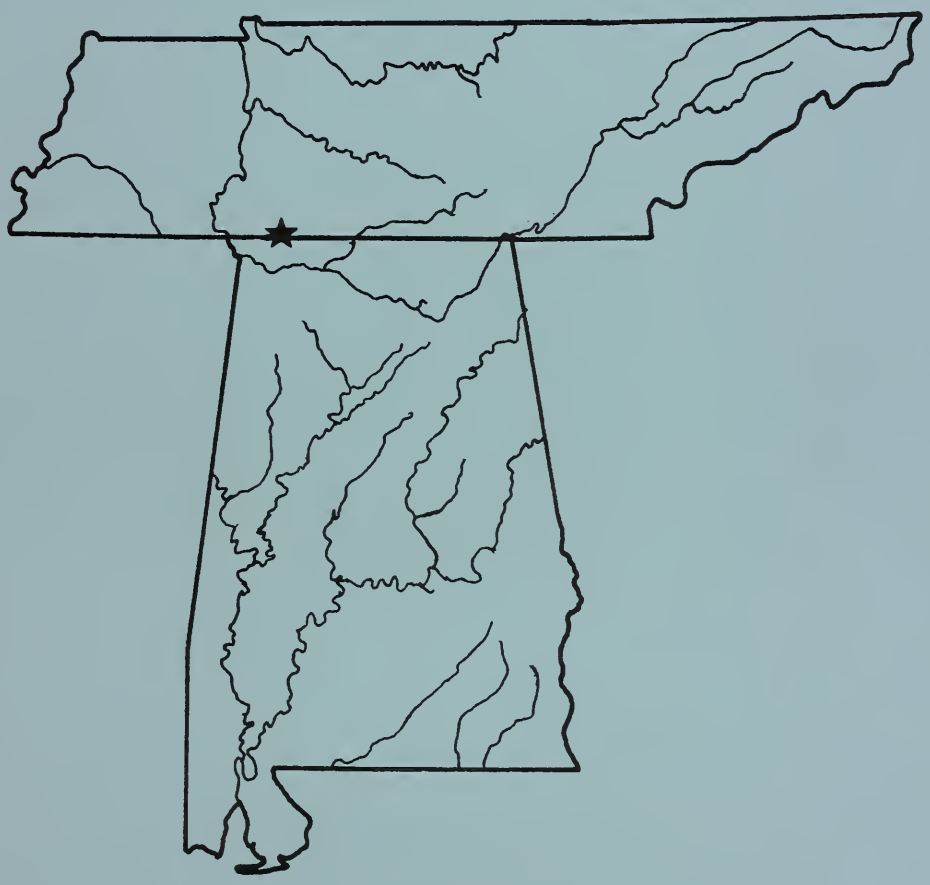
WATERSHED WORK PLAN FOR WATERSHED PROTECTION AND FLOOD PREVENTION

CYPRESS CREEK



LAUDERDALE COUNTY, ALABAMA

AND

WAYNE COUNTY, TENNESSEE

4-35132

USDA-SCS-FORT WORTH, TEX. 1975

ADDENDUM
CYPRESS CREEK WATERSHED
Lauderdale County, Alabama and Wayne County, Tennessee

INTRODUCTION

This addendum is based on the Water Resource Council's "Principles and Standards for Planning Water and Related Land Resources," which became effective October 30, 1973. It is prepared to be consistent with the requirements of the Water Resource Council's Procedure No. 1 for the phase-in of the Principles and Standards. The information presented is:

Part I - Benefits to Cost Comparison

An evaluation of the selected plan using current normalized prices, current construction costs, and the current interest rate.

Part II - Four Account Displays

Evaluated effects of the selected plan are displayed under separate accounts for (1) National Economic Development, (2) Environmental Quality, (3) Regional Development, and (4) Social Well-Being. The displays are consistent with the intent of the Principles and Standards.

Part III - Abbreviated Environmental Quality Plan

An environmental quality plan, consistent with the intent of the Principles and Standards, but which is abridged in detail, has been developed by an interdisciplinary team. It is an alternative plan to the selected plan and is formulated to enhance environmental quality by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. This plan was formulated from information and data obtained during the investigative and analysis phases of project planning. Formulation began with the inventory and recognition of the watershed problems and needs. Desired environmental effects, as translated from the problems and needs, provided a basis for examining appropriate water and land resource use and management opportunities. Opportunities that emphasized contributions to the component needs were selected and are shown as plan elements of the abbreviated environmental quality plan. The cost of $1,660,100 for its installation is a preliminary estimate.

Implementation of features of this environmental quality plan would require acceptance by the local people. Adequate legal authorities do exist for installation; however, funding for all plan elements is presently not available through existing legislative authorities.

PART I

The work plan contains project costs, benefits, and benefit-cost ratio based on a 6 1/8 percent interest rate. Crop and pasture benefits based on current normalized prices (October 1974), other costs and benefits based on 1975 prices. Annual project costs, benefits, and benefit-cost ratio are as follows.

1.	Project benefits	$933,050
2.	Project costs	$523,050
3.	Project benefit-cost ratio	1.8:1.0
4.	Project benefit-cost ratio without secondary	1.3:1.0

PART II

Selected Plan

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
CYPRESS CREEK WATERSHED

Components	Measures of Effects 1/ (Dollars)
Beneficial effects:	
A. The value to users of increased outputs of goods and services.	
1. Flood prevention & erosion control	537,550
2. Utilization of underemployed	111,100
Total beneficial effects:	648,650

Components	Measures of Effects 1/ (Dollars)
Adverse effects:	
A. The value of resources required for a plan.	
1. Nineteen floodwater retarding structures, bedload removal, new channel excavation, and clearing and shaping.	
a. Project installation	440,700
b. Administration	62,850
c. Operation & Maintenance	19,500
Total adverse effects:	523,050
Net beneficial effects:	125,600

1/ Average annual

January 1976

Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT
CYPRESS CREEK WATERSHED

Components	Measures of Effects
A. Areas of natural beauty	1. Funds and resources would be available to enhance the physical appearance of creeks by removing sandbars and bedloads.
	2. Reduced peak flows on all channels below structures would encourage vegetative growth and natural wildlife habitat.
	3. Sixty acres of critically eroding road-banks and borrow pits would be shaped and vegetated. Conservation land treatment measures will add to the scenic beauty of the entire watershed.
	4. Visual quality of the area will be reduced by the removal of trees and excavation during the construction process.
B. Quality considerations of water and land resources	1. Reduce erosion and soil loss by 47 percent.
	2. Reduce sediment deposition at the mouth of the watershed.
	3. Reduced drowning of livestock and wildlife from flooding will aid in maintaining stream quality.
	4. Reduced sediment from conservation land treatment will reduce nutrient and pesti-cide movement into streams. Chemicals attached to soil particles would not be transported by the erosion process.
	5. Air and water pollution will be increased during project construction.

Selected Plan (cont'd)

ENVIRONMENTAL QUALITY ACCOUNT
CYPRESS CREEK WATERSHED

Components	Measures of Effects
C. Biological resources and selected ecosystems	1. Wildlife food and cover will be supplied by vegetation planted on the spoil areas and by wildlife food plantings in the pool areas of structures with water level management gates.
	2. Cool water inlets in structures will provide a means of reducing downstream temperatures.
	3. Reduce downstream destruction of fish and wildlife habitat from sediment deposition.
	4. Removal of trees and underbrush for project installation.
	5. Modification of 14.4 miles of stream channels.
	6. Wildlife in area will be temporarily displaced during project installation.
D. Irreversible and irretrievable commitments	1. Land to construct dams, spillways, and borrow areas will require 420 acres and channel work will require 406 acres of which 308 acres will not be permanently required.
	2. Sediment pools and dams of the 19 floodwater retarding structures will inundate 10.2 miles of streams, one farm pond, and one rainbow trout raceway.
	3. Labor, materials, and energy for installation of the project measures.
	4. Destruction and/or salvage of archeological sites during project installation.

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT
CYPRESS CREEK WATERSHED

Components	Measures of Effects 1/ State of Alabama (Dollars)	Rest of Nation
Income:		
Beneficial effects:		
A. The value of increased output of goods and services to users residing in the region.		
1. Flood prevention and erosion control.	557,550	
2. Utilization of underemployed and unemployed labor resources	111,100	
B. The value of output to users residing in the region from external economics		
1. Induced by and stemming from effects	284,400	
Total beneficial effects	933,050	

Components	Measures of Effects 1/ State of Alabama (Dollars)	Rest of Nation
Income:		
Adverse effects:		
A. The value of resources contributed from within the region to achieve the outputs.		
1. Nineteen floodwater retarding structures, bedload removal, new channel excavation, and clearing and shaping.		
a. Project installation	48,450	392,250
b. Administration	600	62,250
c. Operation & Maintenance	19,500	
Total adverse effects	68,550	454,500
Net beneficial effects	864,500	-454,500

1/ Average annual

January 1976

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT (Cont'd 2)
CYPRESS CREEK WATERSHED

Components	Measures of Effects: State of Alabama	Measures of Effects: Rest of Nation
Employment:		
Beneficial effects:		
A. Increase in the number and types of jobs		
1. Employment for project construction	325 semiskilled jobs during 10 years. 18 skilled jobs during 10 years.	---
2. Employment for project operation and maintenance.	2.3 permanent semiskilled jobs.	---
Total beneficial effects:	325 semiskilled jobs during 10 years; 18 skilled jobs during 10 years; 2.3 permanent semiskilled jobs.	

Components	Measures of Effects: State of Alabama	Measures of Effects: Rest of Nation
Employment:		
Adverse effects:		
A. Decrease in number and types of jobs	0	0
Total adverse effects:	0	0
Net beneficial effects:	325 semiskilled jobs during 10 years; 18 skilled jobs during 10 years; 2.3 permanent semiskilled jobs.	

January 1976

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT (Cont'd 3)
CYPRESS CREEK WATERSHED

Components	Measures of Effects: State of Alabama	Measures of Effects: Rest of Nation	Components	Measures of Effects: State of Alabama	Measures of Effects: Rest of Nation
Population Distribution:					
Beneficial effects:	Create 325 semiskilled jobs and 18 skilled jobs during a 10 year installation period in an area that experienced a 5.1 percent unemployment in Lauderdale County, Alabama, and 5.5 percent unemployment in Wayne County, Tennessee, during 1972.	---	Adverse effects:	---	---
Regional Economic Base and Stability:					
Beneficial effects:	Create 325 semiskilled jobs and 18 skilled jobs during 10 years. An additional 2.3 permanent semiskilled jobs will be created for operation and maintenance. Flood hazard will be reduced 70 percent on 10,321 acres of flood plain land.	--	Adverse effects:	---	---

Selected Plan

SOCIAL WELL-BEING ACCOUNT
CYPRESS CREEK WATERSHED

Components	Measures of Effects
Beneficial and adverse effects:	
A. Real Income Distribution	1. Create 325 man-years of semiskilled employment and 18 man-years of skilled employment during the ten year installation period.
	2. Create an average annual regional 1/ income benefit distribution of $537,550.
	3. Local cost to be borne by region total $68,550 average annual.
B. Life, Health, and Safety	1. Provide 70 percent level of flood protection for 320 landowners in the flood plain. Reduce road and bridge washouts thereby reducing the chance of automobile accidents and traffic delays to work and school. Protection from flooding will reduce drowning of livestock and wildlife thereby reducing a potential health hazard from decaying animals.

1/ The realization of these damage reduction benefits is considered to occur in the measure area. Secondary and redevelopment average annual benefits ($284,400 and $111,100) will occur outside the area.

January 1976

PART III

ABBREVIATED ENVIRONMENTAL QUALITY PLAN
Cypress Creek Watershed
Lauderdale County, Alabama, and Wayne County Tennessee

The goals of this environmental quality plan for the Cypress Creek Watershed are to preserve and enhance areas of natural beauty; maintain and improve the quality of water, land, and air resources; preserve and enhance the biological resources and ecosystems; and preserve and enhance archaeological, historical, and unique scenic resources of the watershed so that man can live in an aesthetically and culturally pleasing environment.

Cypress Creek Watershed is located in Lauderdale County in northwest Alabama, and Wayne County, south-central Tennessee. This watershed is within the Tennessee River Basin. Ten towns or communities lie within the watershed and a large quad-city area of 85,000 people (per 1970 census) is located near the lower portion of the watershed.

Cypress Creek Watershed contains three major streams with numerous tributaries. Topography varies from nearly level in the flood plain to moderately rolling and steep in the uplands. Forest land covers 62.8 percent of the 135,360 acre watershed, pastureland and cropland account for 18.5 and 11.8 percent respectively, and miscellaneous 6.9 percent.

The environmental quality problems in the watershed are the deterioration of the land, plants, and water resources. Cropping systems exceeding land capabilities are common in the watershed. This results in average erosion from cropland of 14.1 tons per acre per year. Severe erosion also occurs on about 60 acres of critical roadbanks, field gullies, and borrow pits. Erosion from the uplands travels suspended in runoff as bedload and is deposited in stream channels. Channels filled with bedload and clogged with logjams and trash cause frequent flooding in the flood plains. This prevents timely planting and harvesting of crops, causes crop destruction resulting in loss of income, and causes damages to roads, bridges, fences, and barns. A number of roads are closed several times a year due to flood damage.

Component needs for solving problems relating to specific environmental conditions are listed below:

1. Areas of Natural Beauty
    a. Beautify creeks near roads by removing trash and landscaping the areas to provide a natural setting.
    b. Reduce litter along parkway road
    c. Preserve wild flower site along Rash Road and Cypress Creek (S. E. of Lovelace Crossroads).
    d. Preserve wildlife area on private farm in vicinity of Sharp's Mill.

2. Quality of Water, Land, and Air Resources
   a. Reduce litter along roads.
   b. Reduce erosion by converting eroding cropland to pasture or forest land.
   c. Reduce erosion on roadbanks and in urban areas.
   d. Reduce erosion on critical gullies and borrow pits.
   e. Develop land use regulations and zoning.
   f. Preserve Cox Creek Spring area near Mars Hill.
   g. Reduce and control wildfires.

3. Biological Resources and Ecosystems
   a. Preserve wildflower site near Rash Road.
   b. Preserve wildlife area on private farm in vicinity of Sharp's Mill.
   c. Provide a bird sanctuary between Threet Creek and North Fork Creek.
   d. Convert eroding cropland to pasture or forest land to reduce erosion.
   e. Reduce erosion on critical gullies and borrow pits.
   f. Install nesting boxes for wood ducks and blue birds.
   g. Develop land use regulations and zoning.

4. Archaeological, Historic, and Unique Scenic Resources
   a. Preserve Cox Creek Spring area near Mars Hill.
   b. Preserve and restore former home of Andrew Jackson as a historical monument.
   c. Renovate Grist Mill and provide park area on Little Cypress Creek.

The plan elements for environmental quality consist of land treatment, with critical area treatment, beautification of selected areas, preservation of selected sites and land use controls.

Land treatment measures would improve cropping systems and pasture and hayland management, as well as increase pasture and hayland planting. It would also reduce erosion, provide wildlife food and cover through upland game habitat management, provide for livestock water, and beautify the area with improved vegetative practices. Land users will be encouraged to apply and maintain land treatment measures by the local soil and water conservation districts with technical assistance supplied by the Soil Conservation Service. Other program assistance, as available, will be used to cost share in the installation of these measures.

Treatment of critically eroding gullies and borrow pits would be cost shared with PL-566 and other funds provided by the local sponsoring organizations. The cost of preserving the natural areas and their respective beautification would be the responsibility of the soil and

water conservation districts working through the individual landowner. The preservation of the historical sites would be the responsibility of a local historical society at local expense.

Flood plain restrictions on development in flood prone areas along streams in the watershed would be enacted. The Lauderdale County, Alabama, and Wayne County, Tennessee, commissioner's courts would implement this segment of the plan. Installation of this environmental plan would be the responsibility of the sponsoring organizations and the Soil Conservation Service.

The estimated installation costs of the elements of the environmental quality plan are as follows:

Conservation Land Treatment	$1,388,700
Beautification of Selected Areas	15,000
Preservation of Selected Sites	50,000
Land Use Controls	206,400

The total installation cost of implementing the environmental quality plan is estimated to be $1,660,100.

The environmental effects that would result from implementing the environmental plan are as follows:

1. Areas of Natural Beauty
   a. Provide a diversity of landscape through planned land use.
   b. Eliminate unisghtly areas of active erosion on 60 acres of eroding roadbanks and borrow pits.
   c. Improve aesthetics of Grist Mill by creating a park-like atmosphere on Little Cypress Creek.

2. Quality Considerations of Water and Land Resources
   a. Improve quality of water in Cypress Creek and its tributaries by:
      (1) Reducing sediment being delivered to streams from sheet erosion, flood plain scour, and streambank erosion.
      (2) Reducing sediment through application of conservation land treatment which would reduce nutrient and pesticide movement into streams. Chemicals attached to soil particles would not be transported by the erosion process.
   b. Maintain and enhance the productivity of the land resource base.
   c. Protect the land resource base from further deterioration by reducing sheet erosion, flood plain scour, streambank erosion, and sediment deposition through the application and maintenance of land treatment measures.
      (3) Reduce and control wildfires.

3. Biological Resources and Selected Ecosystems.
   a. Improve upland wildlife habitat on about 170 acres of agricultural land with wildlife plantings.
   b. Improve the quality of habitat for wildlife through proper management of agricultural land and preservation of wildlife areas.
   c. Maintain natural wildflower site near Rash Road.
   d. Reduce downstream destruction of fish and wildlife habitat from sediment deposition.

4. Archaeological, Historical and Unique Scenic Resources
   a. Cox Creek Spring area near Mars Hill would provide nature study on a natural setting as well as a source of water.
   b. Renovated Grist Mill and adjacent park would provide an opportunity to observe past production methods as well as a source of outdoor recreation.

5. Irreversible and Irretrievable Commitments
   a. Labor materials and energy for installation of the project measures.

WATERSHED WORK PLAN

CYPRESS CREEK WATERSHED

LAUDERDALE COUNTY, ALABAMA

AND

WAYNE COUNTY, TENNESSEE

Prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended.

Prepared by: Cypress Creek Watershed Conservancy District
Three Cypress Creek Watershed District
Lauderdale County Soil and Water Conservation District
Wayne County Soil Conservation District
Lauderdale County Commission
University of North Alabama

With assistance by: U. S. Department of Agriculture
Soil Conservation Service

U. S. Department of Agriculture
Forest Service

January 1976

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WATERSHED WORK PLAN AGREEMENT

between the

Cypress Creek Watershed Conservancy District
Lauderdale County Soil and Water Conservation District
Lauderdale County Commission
Wayne County Soil Conservation District
Three Cypress Creek Watershed District
University of North Alabama
(Hereinafter referred to as the Sponsoring Local Organizations)

State of Alabama
State of Tennessee

and the

Soil Conservation Service
United States Department of Agriculture
(Hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Cypress Creek Watershed, State of Alabama and State of Tennessee, under the authority of the watershed protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Cypress Creek Watershed, States of Alabama and Tennessee, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about ten years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms,

conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organizations will acquire, with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost is $683,800.) The percentages of this cost to be borne by the Sponsoring Local Organizations and the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (percent)	Service (percent)	Estimated Land Rights Costs (dollars)
All Structural Measures	100	0	$683,800

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, and make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organizations	Service	Estimated Relocation Payment Costs
Relocation Payments	19.0	81.0	$23,200

3. The Sponsoring Local Organizations will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organizations and by the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (percent)	Service (percent)	Estimated Construction Cost (dollars)
Nineteen Floodwater Retarding Structures 14.4 miles of channel work.	0	100	$6,018,800

4A. The percentages of fire suppression equipment cost to be paid by the Sponsoring Local Organizations and by the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (percent)	Service (percent)	Estimated Cost (dollars)
Fire Suppression Equipment	50	50	$ 4,000

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organizations and by the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (percent)	Service (percent)	Estimated Engineering Cost (dollars)
Nineteen Floodwater Retarding Structures and 14.4 miles of channel work.		100	$ 450,500

6. Critical area treatment will be accomplished through a diversion of work. For gullies and borrow pits, SCS will provide funds for shaping and for purchase of lime, fertilizer, seed, and mulch. Local sponsors will prepare seedbeds; apply lime, fertilizer and seed; and do necessary repair. For roadbanks, SCS will provide funds for contracting the vegetative work; the local sponsors will do the shaping.

The estimated cost for all critical area treatment is $49,700.

Sponsoring Local Organization	Service	Total
$18,600	$31,100	$49,700

7. The Sponsoring Local Organizations and the Service will each bear the costs of Project Administration which it incurs, estimated to be $8,800 and $1,014,500 respectively.

8. The Sponsoring Local Organizations will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

9. The Sponsoring Local Organizations will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

10. The Sponsoring Local Organizations will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

11. The Sponsoring Local Organizations will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

12. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of work of improvement will be used.

13. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organizations before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

14. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the sponsors having specific responsibilities for the particular structural measure involved.

15. No member of or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

16. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C. F. R. 15.1-15.12), which provide that no person in the United States shall, on

the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

17. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Cypress Creek Watershed Conservancy District
Local Organization

By Douglas C Austin

Title Chairman

Clowerdale Ala. 35617
Address Zip Code

Date 2/17/76

The signing of this agreement was authorized by a resolution of the governing body of the Cypress Creek Watershed Conservancy District.
Local Organization

adopted at a meeting held on February 17, 1976

Arthur L. Hershey
Secretary, Local Organization

Rt. Clowerdale AL 35617
Address Zip Code

Date 2/17/76

Lauderdale County Soil & Water Conservation District
Local Organization

By Lon A. Jones

Title Chairman

P.O. Box 231 Florence Ala
Address Zip Code 35630

Date 2-17-76

The signing of this agreement was authorized by a resolution of the governing body of the Lauderdale County Soil & Water Conservation District.
Local Organization

adopted at a meeting held on January 30, 1976

James E. Garnett
Secretary, Local Organization

P.O. Box 26 Rogersville, Ala.
Address

35658-2
Zip Code

Date 2-17-76

Wayne County Soil Conservation District
Local Organization

By Earl Slate

Title Chairman

Waynesboro 38485
Address Zip Code

Date 2/17/76

The signing of this agreement was authorized by a resolution of the governing body of the Wayne County Soil Conservation District.
Local Organization

adopted at a meeting held on February 16, 1976

Zeno Lindsey
Secretary, Local Organization

Collinwood Tn 38450
Address Zip Code

Date 2/17/76

Three Cypress Creek Watershed District
Local Organization

By Ben Berry

Title Chairman

Collinwood Tenn. Rt#2 38450
Address Zip Code

Date 2/17/76

The signing of this agreement was authorized by a resolution of the governing body of the Three Cypress Creek Watershed District.
Local Organization

adopted at a meeting held on February 7, 1976

Leroy Holt
Secretary, Local Organization

Cypress Adm. Tenn 38452
Address Zip Code

Date 2-17-76

Lauderdale County Commission
Local Organization

Court House
Florence, Ala 35630
Address Zip Code

By [signature]

Title Chairman

Date 2/18/76

The signing of this agreement was authorized by a resolution of the governing body of the Lauderdale County Commission.
Local Organization

adopted at a meeting held on February 9, 1976

Carrene D. Campbell
Secretary, Local Organization

P.O. Box 1059, Florence, Al. 3563
Address Zip Code

Date 2/18/76

University of North Alabama
Local Organization

P.O. Box 363
Russellville, Al 35653
Address Zip Code

By [signature]

Title President Pro Tempore
UNA Board of Trustees

Date February 24, 1976

The signing of this agreement was authorized by a resolution of the governing body of the Board of Trustees of University of North Alabama.
Local Organization

adopted at a meeting held on June 3, 1972

[signature]
Secretary, Local Organization

Univ. of North Alabama
Florence, Ala 35630
Address Zip Code

Date February 24, 1976

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

W B Lingle
State Conservationist

5/3/76
Date

WATERSHED WORK PLAN

CYPRESS CREEK WATERSHED

LAUDERDALE COUNTY, ALABAMA AND WAYNE COUNTY, TENNESSEE

January 1976

SUMMARY OF PLAN

General Summary

The work plan for watershed protection and flood prevention for the Cypress Creek Watershed was prepared by the Cypress Creek Watershed Conservancy District, Lauderdale County Commission, Lauderdale County Soil and Water Conservation District, University of North Alabama, Three Cypress Creek Watershed District and Wayne County Soil Conservation District as co-sponsoring local organizations. Technical assistance was provided by the Soil Conservation Service and Forest Service of the U. S. Department of Agriculture.

The Cypress Creek Watershed comprises an area of 135,360 acres with 84,990 acres in Lauderdale County and 50,370 acres in Wayne County. Approximately 12 percent of the watershed is cropland, 18 percent is pastureland, 63 percent is forest land and 7 percent is miscellaneous such as roadsides, farmsteads, urban, wildlife, and idle land.

The major soil and water problems in the watershed are floodwater damages to 10,321 acres of flood plain, flood plain scour, sheet erosion in the upland areas and critical erosion on about 60 acres. The estimated average annual floodwater, erosion, and indirect damages total $407,700 at current normalized prices.

Project objectives are the proper use, treatment, and management of soil and water resources in the watershed, the protection of flood plain lands and property, and the stimulation of the economic development. The project as formulated meets these objectives.

The work plan proposes the installation, during a 10-year period, of a project for the protection and development of the watershed at a total cost of $9,588,300. The share of the cost to be borne by Public Law 566 funds is $7,760,300. The share to be borne by other than Public Law 566 funds is $1,828,000. In addition, the local interests will bear the entire cost of operation and maintenance.

Land Treatment

Land treatment measures planned on 6,000 acres of cropland, 10,050 acres of grassland, and 170 acres of wildlife land include diversions, grassed waterways, field borders, conservation cropping systems, drainage field ditches, drainage mains and laterals, pasture and hayland planting, pasture and hayland management, ponds, and wildlife upland habitat management. These measures will be installed during a 10-year period by landowners in cooperation with the Lauderdale County Soil and Water Conservation District and the Wayne County Soil Conservation District. Technical assistance will be provided by the Soil Conservation Service (SCS).

Critical area treatment will be applied on about 60 acres of critical eroded areas during the 10-year installation period. The work will be accomplished through a division of work. For gullies and borrow pits, SCS will provide funds for shaping and for purchase of lime, fertilizer, seed, and mulch. Local sponsors will prepare seedbeds; apply lime, fertilizer, and seed; and do necessary repair. For roadbanks, SCS will provide funds for contracting vegetative work; the local sponsors will do the shaping. Land Treatment on critical areas will be maintained by the watershed sponsors. Local sponsors will have agreements with landowners or landusers for maintenance of certain areas.

Forest land treatment measures include tree planting, improvement cuts and forest management on 5,700 acres, and intensified fire protection on all forest land. A truck with a removable pumper will be purchased for use in Alabama and a fire contactor program will be used in Tennessee to accelerate the cooperative fire control program. There will be an accelerated technical assistance program carried out during project installation to provide assistance to landowners and users in forest management techniques. Technical assistance for applying the forestry measures on private forest land and in urban areas will be furnished by the Alabama Forestry Commission and the Tennessee Division of Forestry in cooperation with the U. S. Forest Service.

The estimated cost of installing all land treatment measures is $1,388,700. The PL-566 cost is $257,700 and the other cost is $1,131,000.

Structural Measures

Structural measures consist of 19 floodwater retarding structures, and approximately 14.4 miles of channel work. The Lauderdale County Commission will install structural measures in Alabama, and the Three Cypress Creek Watershed District will install structural measures in Tennessee by contract during the 10-year installation period. The estimated installation cost is $8,199,600 of which PL-566 cost will be

$7,502,600 and Other cost will be $697,000. The Lauderdale County Commission will perform or arrange for the performance of operation and maintenance of the floodwater retarding structures and channel work in Alabama. The Three Cypress Creek Watershed District will perform operation and maintenance in Tennessee. Approximately 10,321 acres will benefit from the structural measures. Channel work is planned on 14.4 miles of perennial streams of which 0.36 miles on Dulin Branch have been previously modified by man. Total average annual benefits are $933,050, and the total average annual costs are $523,050 giving a benefit-cost ratio of 1.8:1.

Environmental Impact

The environmental impacts of the proposed project are to reduce average gross erosion rates by 10 percent, stabilize 60 acres having critical erosion problems, reduce downstream sediment delivery by 47 percent, reduce flood damages by 75 percent, increase net income of farm operators, generate additional employment, boost economic activity, and create additional habitat for waterfowl. Floodwater retarding structures and channel work will destroy some habitat for several species of fish that inhabit springs and spring-fed branches. Bedload removal and other channel work will have temporary adverse effects on the habitat of one amphibian and several species of mollusks. There will be about 427 acres of land cleared for the sediment pools, the dam and spillway areas, and along the channel work rights-of-way. There will be either a loss or reduced production from 1,340 acres of pasture and row crops and 785 acres of forest land within the detention pools. In addition, there will be a loss of 208 acres of wildlife habitat on lands to be in the sediment pools and there will be some temporary water and air pollution during construction stages.

Provisions for Financing Local Share of Installation Cost

The cost of installing the needed land treatment measures during the 10-year installation period will be borne by the landowners and operators of the land on which these measures are installed. The Farmers Home Administration, local banks, and other lending institutions can arrange financing for the landowners and operators' share of the cost.

Funds for the local share of the cost of installing the structural measures will be provided by the Three Cypress Creek Watershed District, the Cypress Creek Watershed Conservancy District and the Lauderdale County Commission.

Operation and Maintenance

The Three Cypress Creek Watershed District and the Lauderdale County Commission will be responsible for the operation and maintenance of the structural measures. Land treatment measures for watershed protection will be maintained by landowners or operators of the farms or ranches upon which the measures will be installed under agreements with the soil and water conservation districts.

The estimated average annual cost of operation and maintenance is $19,500.

WATERSHED RESOURCES-ENVIRONMENTAL SETTING*

Physical Resources

General

Cypress Creek Watershed comprises an area of 135,360 acres, or 211.5 square miles, in Lauderdale County in northwest Alabama and Wayne County, south-central Tennessee. Approximately 84,990 acres are in Alabama and 50,370 acres are in Tennessee.

The watershed is located about 125 miles northwest of Birmingham, 125 miles southwest of Nashville, 150 miles east of Memphis, and 65 miles west of Huntsville. The watershed lies within the Tennessee River Basin. Florence, Alabama, with a population of 34,000 per 1970 census, is located partially within the watershed. Numerous small towns and communities in the watershed include North Florence, Cloverdale, McGee Town, Petersville, Mars Hill, Lovelace Crossroads, Central Heights, Sullivan Crossroads, Jacksonburg, and Johnson Crossroads, in Alabama, and Cypress Inn and Fairview, in Tennessee. The Quad-City area of Florence, Sheffield, Tuscumbia, and Muscle Shoals is located either in or near the lower part of the watershed. This area had a population of 85,000 per 1970 census.

In 1970, the urban and rural populations in the watershed were about 35,000 and 3,000 respectively per 1970 census.

The watershed lies in the Tennessee River Water Resource Region and Tennessee-Elk and Lower Tennessee subarea. 16/ Cypress Creek originates in Wayne County, Tennessee, near Collinwood and flows into the Tennessee River near Florence in Lauderdale County, Alabama, about 4.4 miles below Wilson Dam.

Cypress Creek Watershed is influenced economically and socially by the Quad-City area. The water resource region and subarea are not influenced as much by urban areas as is Cypress Creek Watershed. Both the watershed and the water resource region contain good agricultural lands, but most of the region has a more rural character than does Cypress Creek.

* All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigation by the Soil Conservation Service and Forest Service, U. S. Department of Agriculture. References cited are listed at the end of each major section of this document.

The principal problems in the watershed are floodwater damages to the flood plain area, sheet erosion on upland areas, erosion damage to the flood plain, and critically eroding areas. Floodwater damage occurs on 10,321 acres of which 7,851 acres are in cropland or pastureland. Erosion of most of the cropland area in the watershed exceeds an acceptable rate for sustaining high productivity. There are about 60 acres of critically eroding areas along roadbanks, gullies, the borders of agricultural land, borrow pits, and streambanks. These areas are widely distributed but are mostly found in the northern and northwestern portions of the watershed.

Soils

Soils of the upland are derived from limestones, cherty limestones, sands, clays, and gravel. Soils are described by general soil associations (see figure 2). These associations are broad areas of similar landscape that are characterized by one or more soil series names. Soils within an association generally occur in a repeating pattern with certain soils occupying specific landscape positions.

The northern portions of the watershed are mostly within the Dickson-Bodine-Saffell association. Slopes on most of these soils are commonly 2 to 10 percent, but some have slopes up to 35 percent. Most of these soils have fair to good suitability for cropping and are well suited to pasture and forest land. Most of these soils have a moderate hazard in constructing local roads and streets. The limitation for septic tanks is moderate to severe. The limitation for light industry and dwellings is moderate for most soils in this formation.

Soils in the central portion of the watershed are mostly in the Dickson association. The soils of this portion of the upland have the highest potential for agriculture of any soil association in upland areas in the watershed because they have generally more gentle surfaces with less coarse fragments. Slopes commonly range from 1 to 15 percent. Most of the soils in this association have a fair to good suitability for cropland, and they are well suited to pasture and forest land. The hazards encountered in constructing local roads and streets are moderate for most of these soils. The limitations for septic tanks are moderate to severe; and for light industry, it is moderate to severe. Limitations for dwellings are moderate for most of these soils.

Soils in the lower end of the watershed, along the sides of stream valleys, and at lower elevations are mostly within the Bodine-Dewey-Dickson-Fullerton association. Bodine, Dewey, Dickson, and Fullerton are the major soils of the association. They occupy about 90 percent of the area. Bodine, Dewey, and Fullerton are deep, well drained, slightly cherty to very cherty soils. They are on the more sloping and steeper

upland areas of the association. Dickson soils are deep, moderately well drained soils with a fragipan. They are on the less sloping upland areas. Minor soils that make up the remainder of the association are Smithdale and Decatur soils on uplands. Slopes range from 2 to 35 percent. Most of these soils are fairly well suited for cropland and well suited for pasture and forest land. Hazards encountered in constructing roads and streets are moderate to severe. Most of these soils have a moderate limitation for septic tanks, a severe limitation for light industry, and a moderate limitation for dwellings. Most limitations and hazard ratings are assigned to these soils because of their steep slopes. Continuous cropping of these soils on steep slopes causes severe erosion and eventually destroys the soil resource.

A portion of the southeastern part of the watershed is in the Dewey-Decatur-Dickson soil association. The major soils--those in the Dewey, Decatur, and Dickson series--make up about 85 percent of the association. Dewey and Decatur are deep well drained soils on nearly level to sloping uplands. The Dickson soils are deep and moderately well drained with fragipans. They occur on nearly level to gently sloping uplands. The minor soils--those in the Fullerton and Bodine series, and the Grasmere soils in upland depressions--make up the remainder of the association. Slopes of the major soils range from 2 to 10 percent. These soils are well suited to commonly grown row crops and forages if erosion control practices are followed. Hazards encountered in constructing local roads and streets are moderate for most of these soils. The limitation for septic tanks is slight or moderate for the Dewey and Decatur soils and severe for the Dickson soils. Most of these soils have a moderate rating for dwellings and light industry.

The flood plain soils are mostly in the Lobelville-Lee-Etowah-Pruitton association and are related to the upland soils. They are formed in alluvial sedimentary deposits derived from erosion of the uplands. Most are silty soils with gravelly subsoils and sub-strata being common. With good management, these soils will produce high crop and pasture yields. They occupy smooth, level, and generally wide areas with fair natural drainage and little ponding. All are subject to flooding which is a severe hazard to agricultural and urban use.

Along the Tennessee River in the extreme southern end of the watershed, the soils are in the Choccolocco-Chennely-Stasser association. The soils in the association name make up 95 percent of this association. They are deep, well drained to somewhat poorly drained soils on stream terraces and flood plains. The minor soil making up the remainder of the association is an Ennis soil which occupies stream terrace positions. These soils have the potential to produce high yields of row crops and forages. Some of the soils have a wetness hazard. All are subject to flooding which is a severe hazard for all urban uses and a varying hazard to agricultural uses, depending on the individual soil.

Topography

Topography varies from nearly level in the flood plain to moderately rolling and steep in the uplands. Elevations above mean sea level range from 415 feet at the mouth of Cypress Creek to 1,025 feet along the northern boundary of the watershed near the intersection of Natchez Trace Parkway and Tennessee Highway No. 13 (see figure 1).

The upland is somewhat rolling with steep breaks near the stream valleys. Occasionally, rocky cliffs line the stream along the lower 10 miles of Cypress Creek and the middle one-third of Little Cypress Creek. The entire upland becomes rougher and more rolling toward the northwest in the gravelly "high coastal plains" country in Tennessee.

Geology 1/ 2/

The watershed lies within two physiographic sections: the Fall Line Hills of the East Gulf Coastal Plains Physiographic Province and the Highland Rim Section of the Interior Low Plateaus Physiographic Province. The transition from one section to the other is not distinct but takes place gradually as the characteristics of one area begin to fade and the other predominates. Technically, most of Wayne County, Tennessee, is in the Highland Rim but has a capping of Coastal Plains material on the ridges and high points. Conversely, the deeper valleys of the Coastal Plains in the western part of the watershed are cut down through the thin wedge of Coastal Plains material to the underlying Paleozoic rocks below.

The geologic formations in the watershed are marine and non-marine Paleozoic and Mesozoic sedimentary rocks. The outcropping strata are of Mississippian and Upper Cretaceous Ages (see figure 5).

The Cretaceous formations crop out in the northern and western portion of the watershed and extend to the northwest. Their outcrop occurs in the Fall Line Hills of the Coastal Plains Physiographic Province. The marine and non-marine sedimentary rocks include beds of sand, gravel, and clay. The strata dip westward and southwestward with a dip, of about 30 to 45 feet per mile. Deposits are assigned to the Cretaceous System, Upper Cretaceous Series, and are in ascending order: the Tuscaloosa Group, which has not been differentiated in the watershed, and the Eutaw Formation.

The Tuscaloosa consists mainly of gravel but contains vari-colored lenticular beds of clay and sand. The gravel is composed almost entirely of rounded chert pebbles. These rounded pebbles distinguish the Tuscaloosa Group from the underlying weathered Fort Payne or Tuscumbia, in

which the chert is angular. "Hardpan" layers of sand, bound together by ferrunginous cement, are common throughout the deposits. Except for the "hardpan", which usually extends only a few feet laterally, the gravel shows little stratification, the sands and clays are partly stratified; cross-bedding is fairly common in the sands. The Tuscaloosa rests unconformably on weathered bedrock of Mississippian Age. The formation thickens westward and passes beneath the Eutaw Formation along the western border of the watershed in Wayne County, Tennessee. The Tuscaloosa is apparently non-marine in surface exposures, consisting of land derived sediments (sand, clays, and gravel) deposited in a delta-like environment.

The Eutaw consists mostly of cross-laminated, fine to medium-grained, well sorted micaceous sand interbedded with micaceous glauconitic clay. The sediments of the Eutaw are typical of a shallow marine environment.

The Mississippian formations cropping out in the watershed are within the Highland Rim Section of the Interior Low Plateaus Physiographic Province. The formations in ascending order are Fort Payne Chert and Tuscumbia Limestone (The Tuscumbia is equivalent to the Warsaw and St. Louis of Tennessee reports but is undifferentiated in the vicinity of the watershed).

The Fort Payne Chert consists mostly of thin to medium bedded hard siliceous limestone. It contains large quantities of chert (opaline silica or chalcedony) as nodules, lenses, and bands. The chert is disseminated throughout but is prevalent near the base of the formation. The formation weathers to a solid, brittle, blocky chert, and siliceous shale.

The Tuscumbia Limestone consists of thin to medium bedded, finely crystalline, hard limestone with nodules and bands of chert. In most of the area, the formation is completely weathered to clay and silt; and surface exposures are rare.

The two Mississippian formations are almost completely covered by a thick mantle of unconsolidated rock debris known as regolith. This includes all unconsolidated deposits except the Cretaceous formations and consists of weathered rock, alluvial, terrace, and slope wash deposits. The regolith varies considerably in thickness from less than 50 feet in stream valleys to more than 100 feet in the uplands. This is an important source of ground water to wells and streams.

The watershed is on the southwest flank of the Nashville dome. Regional dip of the rocks is toward the southwest at 30 to 45 feet per mile. Subsurface mapping of the top of the Chattanooga Shale indicates several small anticlines, synclines, basins, and other structures in the vicinity of the watershed. A small elongated basin extends nearly due east beneath Cox Creek Valley north of Florence in the watershed.

Climate:

Rainfall in Cypress Creek Watershed averages 49 inches per year with October being the driest month and March being the wettest. Thunderstorms and intense showers of short duration are common during the spring. Dry conditions prevail from mid-summer to late fall, but severe droughts are uncommon. Average monthly rainfall in inches is as follows: 17/

Jan.	5.2	May	3.4	Sept.	3.1
Feb.	5.2	June	3.4	Oct.	2.7
Mar.	5.6	July	4.3	Nov.	3.6
Apr.	4.0	Aug.	3.3	Dec.	4.9

Winters are relatively mild and summers warm. The average annual temperature is 61 degrees Fahrenheit with the average monthly temperature varying from 45 degrees Fahrenheit in February to 81 degrees Fahrenheit in July. These temperature extremes range from a high of about 95 to 100 degrees Fahrenheit in June and July to a low of 0 to -5 Fahrenheit degrees in January and February.

The length of the growing season is about 200 days with the last killing frost occurring in April and the first occurring in October.

Mineral and Ground Water Resources

Sand and gravel are plentiful in the watershed. Gravel has been mined from open roadside pits in the northern portion of the watershed (Wayne County, Tennessee) and from flood plain alluvium and stream deposits in isolated places throughout the watershed. A mixture of gravel and clay is mined for road fill in the central portion of the watershed; these road material quarries are locally called "chert pits". Sand and gravel are dredged from the Tennessee River below the mouth of Cypress Creek with the watershed a source of some of this material. Because of the wide distribution of these resources, mining is more closely related to point of need and location of an operator's holdings rather than to the location of isolated mineral deposits.

Recent interest in finding new sources of fuel has reidentified the Chattanooga Shale as a source of radioactive material. The Chattanooga Shale underlies nearly all the watershed, but it lies at depths of 100 to 250 feet or more. Mining of this radioactive material is a remote possibility.

Limestone has not been extensively mined. The limestone formations in the watershed are highly siliceous and are not useful for lime because of their high silica content. These limestones are useful for crushed rock. But they are deeply buried with their own weathering products and cannot compete with quarries where the overburden is shallow. Limestone mining has low potential for development in the watershed.

Ground water in the watershed exists mostly as non-artesian or unconfined water. Some artesian conditions exist in the Tuscumbia Limestone, Fort Payne Chert, and deeper formations; but pressures are generally not sufficient to produce flowing wells (see figure 6).

Most ground water discharge in the watershed is from springs. The larger springs flow from fractures in the Fort Payne Chert and Tuscumbia Limestone, but many minor springs flow from sands and gravel beds in the Tuscaloosa Group and from the regolith.

Where the Tuscaloosa Group is continuous over large areas, it furnishes enough water to wells for domestic and livestock needs. The Tuscaloosa is an important aquifer to the west and south of the watershed. The saturated zone within the watershed is too thin to produce large volumes of water, but the watershed is part of an important recharge area. Water is of good quality with an average hardness of 25 ppm (parts per million).

Most wells in the southern two-thirds of the watershed obtain water from the regolith on the Fort Payne Chert and Tuscumbia Limestone. The regolith yields water to either dug or drilled wells nearly everywhere it exists, but large yields are uncommon. Springs are common but small. Water is of satisfactory quality, but many of the wells are subject to pollution. Occasionally, local concentrations of chlorides make water unsatisfactory for household use.

Land Use

Present land uses in the watershed are:

Land Uses	Present	
	Acres	Percent
Cropland	15,947	11.8
Pasture land	25,046	18.5
Forest land	84,992	62.8
Miscellaneous	9,375*	6.9
Total	135,360	100.0

* Roadsides, farmsteads, urban, wildlife, and idle land.

The present land uses in the flood plain are as follows:

Land Uses	Present	
	Acres	Percent
Cropland	3,261	31.6
Pasture land	4,590	44.5
Forest land	2,291	22.2
Idle	55	0.5
Miscellaneous	124	1.2
Total	10,321	100.0

Land uses around gullied areas of the watershed are mostly in pasture and forest land or along roadbanks.

Surface Water Resources

Cypress Creek Watershed contains three major streams with numerous tributaries entering them. The three streams are Cypress Creek, Middle Cypress Creek, and Little Cypress Creek (see figure 1). Cypress Creek originates near Collinwood, Tennessee, and flows in a southerly direction through Wayne County, Tennessee, and Lauderdale County, Alabama, until it flows into the Tennessee River at Florence, Alabama. Cypress Creek is about 3 feet deep, 20 feet wide, and has a capacity of about 250 cfs (cubic feet per second) near Cypress Inn, Tennessee. It increases to 11 feet deep, 100 feet wide, and has a capacity of about 3,000 cfs immediately below its confluence with Little Cypress Creek. From its confluence with Little Cypress Creek, it continues southward about 10.3 miles and enters the Tennessee River about 4.4 miles below Wilson Dam.

Stream channels along Cypress Creek, from its junction with Lindsey Creek, upstream to the Alabama-Tennessee state line are partially to completely filled with gravel. Middle Cypress from the state line downstream to Cypress Creek is in a similar condition but to a lesser degree. In the more severe cases of complete filling, new channels are cut at random by water flow. In these areas it is evident the procedure has repeated itself many times. In some cases, the "cut" channel fills to such a level that water is diverted back into the old channel again.

Occasional rock ledges and shoals are in all the channels, with numerous rock shoals in the mid-portion of Little Cypress Creek and in the lower reaches of Cypress Creek. The shoals in Lower Cypress Creek restrict boat traffic to the lower three miles of the creek. An old mill pond known as Sharp's Mill Dam is located on Little Cypress Creek (see reach XXIII on Project Map). It consists of about 12 water-surface acres with a maximum depth of 4 feet.

Streams in the watershed are perennial with two notable exceptions on the west side of the watershed: Lindsey Creek and Burcham Creek (with its tributary, Bruton Branch) are intermittent about two-thirds of the way down their courses. Streams in the watershed are natural except Dulin Branch which was modified in 1954. Average baseflow is 1.8 cubic feet per second per square mile. 3/

The Alabama Water Improvement Commission has classified the streams in this watershed according to their present use (see page 14).

The Geological Survey of Alabama and the Environmental Protection Agency determined water quality at five places in the watershed. Their data are shown on the Table of Water Quality Data (see page 15).

Three water quality parameters--water temperature, pH, and D. O. (dissolved oxygen)--were determined at several places in the fall of 1973 by Dr. Paul Yokley, Jr., Professor of Biology, Florence State University, Florence, Alabama. 20/ According to these determinations, pH values are lowest in the headwater tributary streams (6.4) and increase progressively downstream (7.2) to the main parts of Cypress Creek. The difference in pH levels is attributed to greater amounts of exposed limestone in the downstream reaches and to the lack of exposed limestone in the upper tributaries, with the exception of Little Cypress Creek. Soft waters which result from the absence of dissolved calcium carbonates are partly responsible for the scarcity of bivalved mollusks in the upper tributary streams. Temperatures ranged from 12 degrees Centigrade in the cooler months to 22 degrees Centigrade in the warmer months. Water tested in Cypress Creek Watershed had a D.O. of ten which indicates a limited amount of organic pollution from sources such as feed lots, sewage disposal systems, and fertilizers.

The watershed contains approximately 5,230 acres of Type I wetland as defined in Wetlands of the United States, U. S. Department of the Interior, Fish and Wildlife Service, Circular C-39. Other small areas of wetland types may exist in the watershed.

WATER USE CLASSIFICATIONS*
CYPRESS CREEK WATERSHED
Lauderdale County, Alabama, and Wayne County, Tennesse

Stream	From	To	Public Water Supply	Swimming	Fish and Wildlife	Fish and Wildlife as a Goal **
CYPRESS CREEK	TENNESSEE RIVER (Pickwick Lake)	City of Florence Water Treatment Plant			X	
CYPRESS CREEK	City of Florence Water Treatment Plant	Little Cypress Creek	X		X	
CYPRESS CYPRESS	LITTLE CREEK	Ala-Tenn State Line			X	
LITTLE CYPRESS CREEK	CYPRESS CREEK	Ala-Tenn State Line			X	

* From "Water Use Classifications for Interstate and Intrastate Waters of the State of Alabama" by the Alabama Water Improvement Commission as of September 17, 1973.

** Fish and Wildlife as a Goal pertains to all waters in the state which have not been classified.

** Fish and Wildlife as a Goal pertains to all waters in the state which have not been classified.

WATER QUALITY DATA
CYPRESS CREEK WATERSHED
LAUDERDALE COUNTY, ALABAMA AND WAYNE COUNTY, TENNESSEE

Date of Collection	Discharge (CFS)	Silica (MG/L)	Iron (UG/L)	Calcium (MG/L)	Magnesium (MG/L)	Sodium (MG/L)	Potassium (MG/L)	Bicarbonate (MG/L)	Sulfate (MG/L)	Chloride (MG/L)	Flouride (MG/L)	Nitrate (MG/L)	Dissolved Solids(MG/L	Hardness MG/1	Calcium Hardness MG/L	Noncarbonate	Specific Conductance (micromho)	pH (SU)	Color (UNITS)	BIOCHEMICAL OXYGEN DEMAND	DISSOLVED OXYGEN	WATER TEMP. DEGREES F	TURBIDITY	NITRITE (MG/L)	AMMONIA (MG/L)	PHOS-D ORTHO (MG/L P)	PHOS-T P-WET (MG/L)	TOT KJEL (MG/L)
*	CYPRESS CREEK AT FLORENCE																											
5-5-65	225	5.9	0.06	13	0.6	1.6	0.5	42	2.2	1.7	0.1	0.2	A47	35	11		76	6.5	15									
*	CYPRESS CREEK NEAR CLOVERDALE																											
9-1-60		7.0	0.11	8.2	0.7	1.1	0.2	27	2.8	2.8	0.1	0.0	36	24	2		52	6.6	2			74						
*	MIDDLE CYPRESS CREEK NEAR CLOVERDALE																											
9-1-60						1.2	0.6	60	j2	9			i61	49	0		102	7.3	3									
*	LITTLE CYPRESS CREEK NEAR FLORENCE																											
9-1-60						0.8	0.4	62	j1.7				i61	51	0		102	7.7	3									
**	CYPRESS CREEK (BRIDGE ON WATERLOO ROAD)																											
3-3-73												.428											.003	.032	.024	.056	.64

* U.S. GEOLOGICAL SURVEY OF ALABAMA "A COMPILATION OF SURFACE WATER QUALITY DATA IN ALABAMA CIRCULAR 36"

** ENVIRONMENTAL PROTECTION AGENCY (indicated value represents the mean value determined over a period of measurement from 3/3/73 to 7/14/73)

A-Calculated

i-Sum of mineral constituents in ppm equals specific conductance times a factor

j-Parts per million SO_4 + Cl = equivalents per million bicarbonate times 41.7

Present and Projected Population

Wayne County, Tennessee had a 1950 population of 13,864 with 8,109 rural farm residents. In 1960 the total population had dropped to 11,908 and rural farm population had dropped to 3,984. The total population increased to 12,365 in 1970 but rural farm population decreased to 1,788. 18/ The total population is projected to be 17,000 by 1990 and 27,700 by 2020. 5/ The rural farm population is expected to decrease at a slower rate.

Lauderdale County, Alabama had a 1950 population of 54,197. By 1960 the population had increased to 61,622 with 9,473 rural farm residents. The total population increased to 68,111 in 1970 with rural farm population decreasing to 5,012. 18/ The total population is projected to be 78,800 by 1990 and 91,200 by 2020. 4/ The rural farm population is expected to decrease at a slower rate and may stabilize with increased demand for food and fiber.

The 1969 population of the Tennessee-Elk water resource subarea was 725,300. It is projected to be 982,100 in 1990 and 1,521,700 in 2020. Population of the Lower Tennessee water resource subarea was 296,100 in 1969. It is expected to be 392,500 in 1990 and 606,100 in 2020. 6/ Most of the watershed population is in the Tennessee-Elk water resource subarea.

Economic Resources

The economy generated within the watershed is based almost entirely on agriculture and associated agribusiness. Agriculture and assosciated agribusiness are expected to be of prime importance to the economy for the forseeable future due to the basic demand for food and fiber.

Nearly all of the land in the watershed is in private ownership. The U. S. Department of Interior, National Park Service, administers the Natchez Trace Parkway, of which about 17.5 miles crosses the western portion of the watershed. The Tennessee Valley Authority (TVA) owns about 575 acres of land in the lower reaches of the watershed.

There are approximately 1,145 farms in the watershed which average about 200 acres in size. Most of the farms are family type. Major farm enterprises are soybeans, cotton, corn, beef cattle, and dairying.

Average crop yields are as follows:

	Unit	Watershed Present Yield/Acre	Flood Plain Present Yield/Acre
Cotton	lbs.	602	590
Corn	bu.	64	60
Soybeans	bu.	26	23
Pasture	AUM*	6.3	5.9

Agricultural land values range from $200 to $600 per acre, depending on soil capability and location. Urban land values range from a few thousand dollars for a city lot to many thousands of dollars for commercial property.

Transportation facilities serving Cypress Creek Watershed are excellent. The Tennessee River provides an economical means of shipping to many parts of the United States. Highway transportation is provided by Alabama Highways 17, 20, 157, and Tennessee Highway 13. In addition, numerous county roads provide excellent farm-to-market transportation. As stated earlier, 17.5 miles of Natchez Trace Parkway traverses the watershed. Both the Southern and the Louisville and Nashville Railroads furnish railway transportation.

Because of rapidly expanding industries in the Quad-City area, excellent markets are available for agricultural products and services.

Lauderdale County, Alabama, has a work force of 19,950 with 5.1 percent (1,017) being unemployed in June 1973. 7/ Most of the employment in Lauderdale County is created by: (1) government, (2) wholesale and retail sales, (3) services, (4) textiles and apparel, and (5) construction. Also, residents in Lauderdale County find employment at an aluminum plant or motor company in nearby Colbert County.

Wayne County, Tennessee has a total work force of 4,010 with an unemployment rate of about 5.5 percent. 8/ Major sources of employment are: (1) apparels, (2) lumber and wood products, (3) metals and machinery, and (4) leather products.

* Animal Unit Month is the amount of grazing that it takes to satisfy the grazing needs of one mature cow for one month.

The economy of the area has improved during the last 10 years. Manufacturing industry has increased employment about 28 percent during this period. Retail trade employment increased about 30 percent, service industry employment 47 percent, and employment in government increased 20 percent. The economy of the area has been greatly improved by the regional development programs of TVA.

It is expected that the economy of Cypress Creek Watershed will be affected by the eight-county Tennessee Valley Resource Conservation and Development (RC&D) Project. Neither Lauderdale nor Wayne County are in the project area, but two counties adjoining Lauderdale are in the RC&D project area. Since some markets for products produced in these adjoining counties are in Lauderdale County, the economy of the watershed will be affected.

Forest products average $5 per cord for pulpwood and $40 per thousand board feet of mostly hardwood sawtimber. Stocking averages about 750 board feet per acre of sawtimber and one cord of pulpwood per acre.

Plant and Animal Resources 20/ 21/

Plant Resources

Commercial forest types include shortleaf pine, loblolly pine, oak-gum cypress, elm-ash-soft maple, oak-hickory, blackjack oak-post oak, yellow pine-hardwood, and cedar-hardwood. 9/

The forest lands of the steep, dissected upper portion of the watershed are oak-hickory type. The dominant overstory species on the ridges and upper slopes with southern exposures include post oak (Quercus stellata), blackjack oak (Q. marilandica) and hickory (Carya spp.). White oak (Q. alba), southern red oak (Q. rubra falcata), northern red oak (Q. rubra var. borealis), yellow-poplar (Liriodendron tulipifera), and elm (Ulmus sp.) are significant species in the overstory on toe-slopes and on slopes with northern exposures. Beech (Fagus grandifolia) and sycamore (Platanus occidentalis) are common on soils that have abundant moisture. The American chestnut (Castanea dentata) was one of the dominant species of this area before it was eradicated by blight.

The secondary stratum of the upper portion of the watershed includes dogwood (Cornus spp.), eastern redbud (Cercis canaden sis), sassafras (Sassafras albidum), and smaller trees of the dominant species.

The understory includes various shrubs, vines, legumes, grasses, and forbs. Dominant grasses, legumes, and forbs include low panicums

(Panicum spp.), three-awn (Aristida sp.), broomsedge (Andropogon virginicus), little bluestem (A. scoparius), Elliott beardgrass (A. elliotti), purpletop (Tridens flavus), perennial lespedezas (Lespedeza virginica, L. violacea, L. procumbens), and aster (Aster sp.). Indiangrass (Sorghastrum nutans), switchgrass (Panicum virgatum), plumegrass (Erianthus alopecuroides), and longleaf uniola (Uniola sessiliflora) are sometimes found on the more fertile and moist sites. Grasses, legumes, and forbs are more abundant on areas where the overstory canopy is sparse or has been temporarily reduced by timber harvest.

Forest lands of the more gentle to moderately sloping uplands have more diversity of plant species. Red oaks, white oaks, and yellow poplar are more abundant in the composition and the blackjack and post oak decline in number. Hackberry (Celtis occidentalis), sweetgum (Liquidambar styraciflua), and maples (Acer spp.) often occur as dominant overstory species. The secondary stratum contains the same species as found in the steep, dissected area as well as additional species such as box elder (Acer negundo), iron wood (Carpinus caroliniana), and black cherry (Prunus serotina).

The understory also has more diversity of plant species than the steep, dissected upland. Wild ryes (Elymus spp.) little barley (Hordeum pusillum), perennial tickclovers (Desmodium spp.), honeysuckle (Lonicera japonica), wild vetches (Cicia spp.), and partridge pea (Cassia spp.) are abundant species in some areas.

Forest lands of the flood plain range from oak-hickory to gum-oak-sycamore to willow-gum-cypress. The dominant overstory of oak-hickory is most consistant in the upper portion of the flood plain. Sycamore and yellow poplar are also common on streambanks in the upper portion.

The sweetgum-oak-sycamore type appears to be most common in the middle and lower portions of the flood plain. The apportionment of individual species varies greatly from one site to another. Some areas that have regenerated from abandoned fields are composed almost entirely of one or two overstory species with no secondary stratum.

There is a great diversity of vines and shrubs in the middle and lower portions of the flood plain; however, grasses and forbs are limited to those that are extremely shade tolerant or plants that make much of their growth during the cool seasons. Low panicums, uniola, wild rye, and stinging nettle (Tragia urticifolia) are commonly found in these areas.

The willow-gum-cypress community is associated with wet or swampy soils. The black willow (Salix nigra) occupies areas that have abundant

soil moisture and may or may not have ponded water during parts of the year. The willow is usually one of the first woody plants to become established near the normal water level of man-made stream channels. The river birch (Betula nigra) is often found in association with black willow.

The bald cypress (Taxodium distichum) grows in swamps in the lower part of the flood plain. This cypress grows in areas too wet for other trees. It also grows in composition with other overstory species along the edges of swamps. Water tolerant plants such as button bush (Cephalanthus occidentalis), sedges (Cyperus spp.), cattail (Typha latifolia), rushes (Juncus spp., Scirpus spp.), and cutgrass (Leersia spp.) are common in the shallow water edges of swamps.

Pine monoculture is not common in the watershed. A few areas in the upper portion of the watershed have been clear cut and planted to loblolly pine (Pinus taeda). These plantings are in early development stages. Native grasses and forbs become established during the first growing season after trees are planted. They continue to increase in variety and volume until the pine canopy closes and reduces sunlight at their level. This usually occurs between 5 and 8 years after the trees are planted.

A few small fields of planted pines occur throughout the watershed. Their ages vary from small seedlings to trees of harvestable age. Most of these plantings appear to have been made in abandoned fields.

Unmolested secondary plant succession in abandoned fields is not common in the watershed. Most abandoned cropland fields are converted to pasture by some degree of grassland management. The abandoned fields that do occur are usually too small to use as economical pasture units. The early stages of plant succession appear to be closely related to typical Piedmont sites described by Oosting, 10/ Billings, 11/ and Odom. 12/ First invaders include crabgrass (Digitaria sanguinalis), horse weed (Erigeron canadensis), and fall panicum (Panicum dichotomiflorum). Soils that are moist and fertile often have plants such as Johnsongrass (Sorghum halepense) and cocklebur (Xanthium pensylvanicun) in the invader composition. Prairie three-awn is one of the first plants to become established on severely eroded, low fertility soils. Asters, common ragweed (Ambrosia artemisiifolia), goldenrod (Solidage spp.), poor joe (Diodia teres), broomsedge, and little barley become dominant during the second, third, and fourth growing seasons. The grass-shrub stage includes bluestems (Andropogun spp.) goldenrod, ragweed, asters, common greenbriar (Smilax rotundifolia), blackberry (Rubus sp.), dewberry (Rubus trivialis), sumac (Rhus sp.), persimmon (Diospyros virginiana), and numerous other native species. Dominant forest-type species become significant during the latter part of the grass-shrub stage. Pines (Pinus spp.) are not common in secondary plant succession in Cypress Creek Watershed.

Plant communities on cropland in the watershed are almost stable systems. Farmers desire to maintain single species in their cultivated row crop fields. They use cultural, mechanical, and chemical methods to curtail the invasion of weeds.

The principal crops grown are soybeans, corn, and cotton. Weeds common in these crops include crabgrass, pigweeds, lambsquarters, cocklebur, Johnsongrass, morning-glories, ragweeds, fall panicum, nutsedge, goosegrass and prickly sida.

Plant communities in improved pastures and haylands are highly managed systems--the objectives are to retain stands of planted species.

Tall fescue (Festuca arundinaceo) and white clover (Trifolium repens) in combination is by far the most important pasture mixture. The most common native invaders are grasses and forbs that produce most of their growth during summer. Weeds commonly found in fescue-clover pastures include broomsedge, ragweed, aster, goldenrod, dogfennel, bitter sneezeweed and foxtail. Naturalized plants such as bermudagrass and Johnsongrass are common invaders. Curly dock is found on wetter soils.

Improved haylands include the fescue-clover mixture, coastal bermudagrass, and annual lespedezas (Lespedeza stipulacea, L. striata). Weed composition of the fescue-clover mixture is similar to that of fescue-clover pastures. Weeds that invade coastal bermudagrass include little barley, crabgrass, goosegrass, and nutsedges. Annual lespedeza must re-establish itself or be seeded every year; therefore, many native grasses and forbs have an equal or better chance of becoming a part of the composition.

The composition of unimproved pastures usually contains a few introduced plants such as fescue, annual lespedezas, white clover, and Dallisgrass (Paspalum dilatatum). But more than half of them are either native or naturalized plants such as broomsedge, little bluestem, native paspalums, bermudagrass, crabgrass, purpletop, hop clovers, and other grasses, forbs, and legumes. Woody plants such as sassafras, persimmon, and hickory are often present because annual mowing is not a common practice.

Annual pastures are grown on a few farms. Summer annual pastures are usually millet (Pennisetum glaucum), sudangrass (Sorghum vulgave var sudanense), or hybrid sorghum. Cool season pastures consist of single species of mixtures of small grain, annual clover, and ryegrass (Lolium multiglorum). These are highly managed pastures that occupy the land only a few months each year; therefore, weeds are not a problem.

Game Resources

Fishing activity is highest in the lower reaches of Cypress Creek and its major tributaries. Fisherman frequently fish from boats in the portion of Cypress Creek between Rash Road and Pickwick Lake. Rash Road marks the northern limit of boat fishing. According to the Tennessee Wildlife Resource Agency, stream fishing is popular locally and is described as fair for bass, sunfish, rockbass, and catfish in the Tennessee portion of the watershed.

The principal species of sport fish are white lake bass (Monrone chrysops), largemouth bass (Micropterus salmoides), spotted bass (Micropterus punctulatus), smallmouth bass (Micropterus dolomieui), rock bass (Amblo-plites rupestris), bluegill (Lepomis macrochirus), catfish (Ictalurus punctatus), and crappie (Pomogis spp.). 21/ During spawning season sauger and white lake bass travel to the upper reaches of Cypress Creek and its tributaries.

The watershed contains an abundance of good habitat for upland game. Sixty-three percent or 84,992 acres of the watershed is forest land, with 93 percent of these forests being hardwoods. The remaining 7 percent are mixed hardwoods and pines. These forests also provide habitat for many species of non-game animals.

Farm game such as rabbits, doves, and quail benefit from the 15,947 acres of cropland in the watershed. Idle land, field borders, grain fields, and the edge between open lands and woods provide good habitat for farm game.

Rabbit, squirrel, and quail populations are moderate. Hunting is moderate for rabbits and squirrels.

Dove populations are generally low throughout the watershed; however, doves sometime congregate during fall and winter in larger grain fields. Hunting for doves is generally low.

Deer and wild turkey populations are considered low but seem to be on the increase. Deer were stocked about 5 miles east of the watershed in 1961 and 1962. 19/ This nucleus deer herd is expected to increase in both numbers and range. It will probably populate the project area.

A fox hunting club owns a lodge and kennel in the upper reaches of the watershed.

Mink and muskrat populations are low to moderate, and trapping activities for these furbearers are low.

Raccoon populations are moderate. Hunting for raccoons is moderate, also. Beaver and waterfowl populations are sparse; as game animals, they are not important in the watershed.

Both game and non-game animals represent opportunities for nature study wildlife photography, and other non-consumptive uses stemming from the inherent aesthetic quality of wildlife resources.

Non-Consumptive Wildlife Resources

Two studies were conducted to collect plant and animal resource data on the Cypress Creek Watershed. The first study was prepared in the fall of 1973 by Dr. Paul Yokley, Professor of Biology, University of North Alabama, and assisted by Authur L. Hershey, Professor of Biology, University of North Alabama and Charles H. Gooch, Biologist, Coffee High School, Florence, Alabama. 20/ Attention was given to rare or endangered organisms in the watershed. The present distribution, the hypothetical distribution, and the threat over the range of this watershed are discussed. The list of animals includes most macroscopic invertebrates and vertebrates which have been recorded in the watershed in the past fifty years. Many of each category have been collected or observed by the authors during the past ten years. Every main tributary of the drainage has been observed and collected. The recorded specific type of habitat required for the larger aquatic invertebrates and vertebrates has been the basis for this report.

The quality of the existing terrestrial and aquatic habitats has been described. The water quality parameters that have been recorded include temperature, pH, and dissolved oxygen. General observations concerning the changes in the watershed over the past twenty-five years are discussed.

Yokley's study concentrated on Mollusca which includes clams, mussels, and snails. Dr. Yokley is a recognized authority on this group of animals.

Another report was prepared by Dr. Herbert T. Boschung, Professor of Biology, University of Alabama and Thomas S. Jandebeur, Graduate Teaching Assistant, University of Alabama. 21/ This report concerned all fauna in the watershed but emphasized fishes, on which the authors are considered authorities.

Invertebrates:

There are no known threatened or endangered invertebrates in the project area. Invertebrate organisms characteristic of the Cypress Creek Watershed are listed in Yokley's report. 20/ The aquatic habitats in the Cypress Creek

drainage area have been steadily decreasing in quality over a period of years. Sediment and debris which result from clearing and cultivating steep areas and removal of this sediment have many destructive effects on aquatic biota including invertebrates.

The lower parts of Cypress Creek appeared turbid and silt laden during most of the summer of 1973. Some of the more silt-sensitive invertebrate species, such as most fresh water mussels, can easily be destroyed by silt. Little Cypress Creek has less debris and silt deposits than Cypress and Middle Cypress Creeks. As a result, Little Cypress has a more diverse fauna and greater densities of each species. Invertebrates are extremely important as food for vertebrates such as fish.

Silt is extremely damaging to the mollusk family Unionidae or fresh-water mussels. Sharp's Mill Dam located on Reach XXIII of Little Cypress Creek has served as a settling basin for silt removal and mussels are concentrated in the entire length of Little Cypress Creek area below Sharp's Mill Dam whereas they are scarce or non-existent throughout the rest of the drainage area. 20/

Other limiting factors for mollusks in the uppermost tributaries of the Cypress Creek drainage, with the exception of Little Cypress, are the low pH values and deficiency of calcium salts. No snails or bivalved mollusks were collected in upper tributary streams containing small amounts of dissolved calcium carbonates. Snails were collected in the upper reaches of Little Cypress Creek and 13 species of mussels were found in this tributary.

Yokley lists 3 families, 12 genera and 26 species of clams and mussels, and 6 families and 12 genera of snails from the Cypress Creek Watershed.

Vertebrates:

Both Yokley and Boschung collected a tremendous amount of information on the fishes of the Cypress Creek Watershed. Yokley has made collections on these streams for the past ten years and has access to information collected over 50 years. Boschung also has access to information gathered before the present work. He used data from 72 collections made prior to the 1974 study, which was comprised of 71 collections. Altogether 143 fish collections from 89 sites (see map A, appendix A) were used. Boschung's work included 27,808 individual fishes representing 14 families, 31 genera, and 56 species.

An Annotated List of Fishes is presented by Boschung. 21/ The Annotated List of Fishes gives specific information about the habitat of each fish. Following each annotation in the fish list is reference to distribution maps contained in Boschung's report.

Summary statistics for total number of individuals, overall percent relative abundance, and overall percent encounter based on 102 collections from the watershed exclusive of collections from springs, Sharp's Mill Reservoir, or otherwise incomplete collections are listed on the following page.

Fish and other vertebrates listed as threatened or endangered by the Alabama Department of Conservation and Natural Resources are divided into three categories; Threatened, Endangered, and Special Concern. The publication Rare and Endangered Vertebrates of Alabama was published in 1972 and is presently being revised.

Definitions used to revise this list of species in Alabama are as follows:

Endangered Species -- Those species in danger of extinction throughout all or a significant portion of their range in Alabama.

Endangered species are those whose prospects for survival are in immediate jeopardy. An endangered species must have help, or extinction and/or extirpation from Alabama will probably follow.

Threatened Species -- Those species which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range in Alabama.

Special Concern -- Those species which must be continually monitored because eminent degrading factors, their limited distribution in Alabama or other physical or biological characteristics, may cause them to become threatened or endangered in the foreseeable future.

The following fish are discussed in the Yokley and Boschung reports under rare and endangered species:

Rare-1. (Special Concern) Etheostoma blennius (Blenny darter). This darter inhabits moderate to very swift riffles and seems to prefer areas with larger stones on the stream bottom. The blenny darter is endemic to Alabama and Tennessee. Yokley concluded that this darter is not common in any portion of the drainage, but occurs in all of the larger streams. Boschung found this darter to be fairly common in Cypress and Shoal Creeks.

The blenny darter is on the federal list of threatened wildlife of the United States 22/. This darter was collected at six localities by Boschung. 21/

Percent encounter (PE) and percent relative abundance (PRA) by major tributaries. Based on 101 collections. Number in parentheses = number of fish collections from major tributary.

PRA = percent relative abundance; total number of individuals of species collected in major tributary divided by the total number of individuals of all species collected from that major tributary.

PE = percent encounter; total number of encounters with a species in tributary stream divided by the total number of collections from that tributary.

Species	Burcham Creek (7)		Lindsey Creek (16)		Big Cypress Creek (25)		Middle Cypress Creek (21)		Little Cypress Creek (24)		Cox Creek (5)		Main Cypress Creek (3)	
	PRA	PE	PRA	PE	PRA	PE	PRA	PE	PRA	PE	PRA	PE	PRA	PE
Ichthyomyzon gagei	-	-	0.17	18.75	0.14	20.00	0.05	9.52	0.02	4.17	0.30	20.00	-	-
Lampetra aepyptera	-	-	0.21	12.50	-	-	0.03	4.76	0.03	8.33	-	-	-	-
Lepisosteus osseus	-	-	-	-	-	-	-	-	-	-	-	-	0.24	33.33
Dorsoma cepedianum	-	-	-	-	0.03	4.00	-	-	-	-	0.30	20.00	1.21	33.33
Esox niger	0.20	28.57	0.25	31.25	0.29	24.00	0.24	33.33	0.02	4.17	-	-	0.24	33.33
Campostoma anomalum	5.30	71.43	7.35	81.25	5.13	68.00	6.18	95.24	15.55	100.00	23.47	100.00	12.11	100.00
Clinostomus funduloides	12.86	85.71	24.47	93.75	35.43	100.00	27.26	95.24	12.50	100.00	10.46	80.00	-	-
Hemitremia flammea	2.06	28.57	1.94	18.75	3.83	60.00	1.49	57.14	2.92	37.50	1.34	20.00	0.97	33.33
Hybopsis amblops	-	-	-	-	-	-	-	-	3.49	29.17	-	-	0.97	66.67
Nocomis micropogon	-	-	-	-	0.34	28.00	-	-	-	-	-	-	2.66	33.33
Notropis ardens	16.68	71.43	14.29	43.75	9.67	52.00	34.15	71.43	23.29	75.00	0.60	20.00	20.34	66.67
Notropis atherinoides	-	-	-	-	-	-	-	-	-	-	0.15	20.00	0.97	33.33
Notropis chrysocephalus	7.26	42.86	1.78	50.00	4.10	44.00	3.36	61.90	8.64	83.33	9.27	40.00	20.58	100.00
Notropis coccogenis	-	-	-	-	0.38	20.00	-	-	0.31	12.50	1.05	20.00	11.62	66.67
Notropis fumeus	3.53	28.57	0.04	6.25	0.03	8.00	-	-	0.30	12.50	-	-	4.84	33.33
Notropis spilopterus	-	-	-	-	-	-	-	-	-	-	-	-	0.17	66.67
Notropis telescopus	-	-	-	-	0.05	4.00	1.30	33.33	-	-	-	-	-	-
Notropis whipplei	-	-	-	-	-	-	-	-	-	-	0.15	20.00	-	-
Phoxinus erythrogaster	2.26	28.57	0.42	18.75	3.50	64.00	3.59	47.62	0.20	20.83	-	-	-	-
Pimephales notatus	0.10	14.29	-	-	0.05	4.00	0.02	4.76	0.52	29.17	0.60	20.00	-	-
Rhinichthys atratulus	-	-	-	-	9.01	48.00	0.20	14.29	0.97	45.83	0.45	20.00	-	-
Semotilus atromaculatus	14.82	85.71	5.41	87.50	8.17	88.00	6.23	95.24	4.46	58.33	10.16	60.00	-	-
Catostomus commersoni	-	-	-	-	-	-	0.02	4.76	-	-	0.15	20.00	-	-
Erimyzon oblongus	1.67	42.86	0.13	12.50	0.12	8.00	0.11	19.05	-	-	-	-	-	-
Hypentelium nigricans	2.45	57.14	1.94	68.75	1.49	76.00	1.52	52.38	2.13	79.17	3.29	80.00	0.24	33.33
Minytrema melanops	-	-	-	-	0.02	4.00	0.09	14.29	0.08	8.33	-	-	0.24	33.33
Moxostoma duquesne	0.10	14.29	-	-	0.09	16.00	-	-	0.39	20.83	0.15	20.00	1.21	66.67
Moxostoma erythrurum	-	-	0.04	6.25	-	-	-	-	0.02	4.17	0.15	20.00	0.24	33.33
Ictalurus natalis	-	-	-	-	0.12	8.00	-	-	-	-	0.45	20.00	-	-
Aphredoderus sayanus	-	-	0.04	6.25	-	-	0.03	4.76	-	-	-	-	-	-
Fundulus catenatus	-	-	0.04	6.25	0.51	12.00	0.25	38.10	0.13	8.33	-	-	-	-
Fundulus olivaceus	9.22	71.43	4.40	87.50	0.92	40.00	1.15	57.14	1.03	50.00	1.94	40.00	2.42	33.33
Gambusia affinis	-	-	0.46	37.50	-	-	0.08	9.52	0.03	4.17	0.75	40.00	0.48	33.33
Ambloplites rupestris	-	-	0.04	6.25	0.02	4.00	0.06	19.05	0.10	12.50	-	-	-	-
Lepomis cyanellus	3.34	71.43	1.99	56.25	3.66	68.00	1.16	57.14	3.23	58.33	8.52	100.00	0.48	33.33
Lepomis macrochirus	0.78	57.14	1.14	43.75	0.48	52.00	0.90	57.14	0.84	66.67	2.69	100.00	3.63	66.67
Lepomis megalotis	1.96	42.86	0.72	37.50	0.24	20.00	0.20	19.05	0.18	25.00	0.90	40.00	1.21	66.67
Lepomis microlophus	-	-	-	-	-	-	-	-	-	-	-	-	0.73	66.67
Micropterus dolomieui	-	-	0.04	6.25	-	-	0.02	4.76	-	-	0.15	20.00	-	-
Micropterus punctulatus	-	-	0.17	18.75	-	-	-	-	-	-	0.45	20.00	2.66	66.67
Micropterus salmoides	-	-	0.30	25.00	0.07	16.00	0.09	19.05	0.16	25.00	0.15	20.00	0.73	33.33
Etheostoma blennioides	-	-	-	-	-	-	-	-	0.59	25.00	-	-	0.48	33.33
Etheostoma blennius	-	-	-	-	0.03	8.00	0.03	4.76	0.10	12.50	-	-	-	-
Etheostoma boschungi	-	-	1.87	56.25	1.49	28.00	0.30	14.29	-	-	-	-	-	-
Etheostoma caeruleum	-	-	1.14	31.25	0.03	8.00	0.42	33.33	2.74	50.00	-	-	-	-
Etheostoma duryi	2.84	57.14	15.04	100.00	1.28	52.00	2.93	66.67	3.16	75.00	7.47	80.00	0.73	66.67
Etheostoma flabellare	-	-	0.36	75.00	3.38	96.00	1.11	57.14	1.51	70.83	4.93	40.00	0.73	66.67
Etheostoma jessiae	-	-	-	-	-	-	-	-	1.06	8.33	-	-	-	-
Etheostoma rufilineatum	-	-	-	-	0.02	4.00	0.05	9.52	2.16	37.50	-	-	1.21	66.67
Etheostoma simoterum	-	-	0.34	18.75	-	-	0.05	4.76	2.15	45.83	1.64	40.00	0.97	33.33
Etheostoma squamiceps	9.72	85.71	7.23	87.50	3.98	88.00	3.34	85.71	1.36	45.83	1.50	40.00	0.24	33.33
Etheostoma zonale	-	-	-	-	-	-	-	-	0.15	8.33	-	-	-	-
Percina caprodes	0.98	28.57	-	-	0.08	8.00	0.09	4.76	1.05	37.50	2.39	80.00	0.73	33.33
Aplodinotus grunniens	-	-	-	-	-	-	0.03	4.76	-	-	0.30	20.00	-	-
Cottus carolinae	1.86	57.14	3.08	37.50	1.83	76.00	1.84	85.71	2.42	79.17	3.74	100.00	2.18	66.67

Source: Report by H. T. Boschung on Fauna of Cypress Creek Watershed

Rare-1. (Threatened) Etheostoma tuscumbia (Tuscumbia darter). This fish is strictly confined to large springs in the Tennessee Valley in North Alabama and Southern Tennessee. It has been collected in the Cypress Creek Watershed only in King Spring, a tributary to Cox Creek. 21/

Rare-2. (Special Concern) Notropis ariommus (Popeye shiner). Notropis boops (Bigeye shiner). Noturus miurus (Brindled madtom). These species have not been collected recently and probably do not exist in the area. An investigator found these fish in the area and listed them in an 1891 publication. 23/

Rare-2. (Special Concern) Notropis coccogenis (Warpaint shiner). This shiner probably prefers cool silt-free water and occupies streams in much of the area. 21/

Rare-2. (Special Concern) Phoxinus erythrogaster (Southern redbelly dace). This fish inhabits springs, spring fed streams and other small headwater streams. Yokley found this species to be most abundant in Burcham Creek and North Fork Branch. 20/ 21/

Endangered. Etheostoma boschungi (Slackwater darter). Boschung, who first described this fish, states that it is known in Alabama only from the Cypress Creek Watershed and from three localities in the Flint River drainage. In Tennessee, this darter is known from the upper parts of Cypress and Middle Cypress and from one locality in the Buffalo River. 21/

Yokley found the slackwater darter most abundant in Lindsey Creek and North Fork Branch, with some collections being made in Middle Cypress and Burcham Creeks. Boschung indicated that this may be the most restricted species in the watershed.

The following fish classified as "Special Concern", inhabit the watershed: 21/

Hemitremia flammea - Flame chub
Notropis telescopus - Telescope shiner
Notropis fumeus - Ribbon shiner
Rhinichthys atratulus - Blacknose dace
Noturus exilis - Slender madtom
Etheostoma jessiae - Blueside darter
*Lagochila lacera - Harelip sucker
*The harelip sucker is probably extinct.
Percina sciera - Dusky darter

Other rare and endangered herptiles, birds, and mammals discussed in Boschung's report are as follows:

Rare

Accipiter striatus - Sharp-shinned hawk
Accipiter cooperii - Cooper's hawk
Aguila chrysaetos - Golden eagle
Haliaeetus leucocephalus - Bald eagle
Pandiun haliaetus - Osprey
Falco peregrinus - Peregrine falcon
Sorex longirostris longirostris - Southeastern shrew
Myotis austroriparius austroriparius Southern eastern myotis
Lasiuras cinereus cinereus - Hoary bat

Endangered

Thryomanes bewickii - Bewick's wren
Myotis sodalis - Indiana myotis

Recreational Resources

Opportunities for outdoor and water-based recreation in the watershed are limited primarily to fishing along the streams and hunting of small game.*

A wide variety of recreational resources, however, are available in the surrounding areas to watershed residents. A summary of these resources is as follows:

TYPE RECREATION	NO. AREAS 13/
Beach area	3
Big game habitat	1
Boat launching areas	7
Camping	5
Driving range - golf	2
Golf courses	4
Historical sites	2
Indian museum	1
Marinas	7
Picnic area	13
Playfields (softball, baseball, etc.)	4
Riding club	1
Reservoir, lake or fish pond	6
Small game habitat	3
Tennis courts	2
Waterfowl habitat	1

* The City of Florence has developed a portion of the TVA-owned land in the watershed into a recreational area.

Cypress Creek was studied for inclusion in a statewide (Alabama) plan for wild and scenic rivers but was not included by the State of Alabama. It has poor flow characteristics, a large number of road crossings, and is clogged with sediment and debris. 13/ The study recommended in part "that consideration be given to restoring Cypress Creek to a free-flowing stream. This may be possible by dredging and other slight alterations without major stream channel improvement". This point is further elaborated in the following quote: "Cypress Creek has a low total recreational use at present and this use will likely decrease as streamflow characteristics deteriorate further. However, fishing provides heavy recreational use during certain periods of the year. Improvements to restore the stream to its natural free-flowing condition may be possible. If so, the stream might then become a state administered recreational river." 13/

Excellent facilities for water-based recreation and fishing are available on the nearby large reservoirs on the Tennessee River. Swimming, picnicking, camping, golfing, fishing, and playing softball are activities in which people of the area participate most often. Most recreational facilities are open to the public. About 17.5 miles of the Natchez Trace Parkway crosses the western portion of the watershed. This parkway offers many site seeing opportunities. Portions of two wildlife management areas of about 15,000 acres are open to the public for hunting small game.

Archaeological, Historical, and Unique Scenic Resources

During the summer of 1974 the University of Alabama, Department of Anthropology conducted an archaeological site survey of the watershed for the Soil Conservation Service. Fifty-nine sites of archaeological importance were located through the survey. A majority of the sites, 28 in all, are situated on Cypress Creek and its tributaries including 23 campsites and 5 undetermined sites. Eleven campsites, 2 undetermined, and 1 small village site were found on Middle Cypress Creek and its tributaries. On Little Cypress Creek and its tributaries 13 sites, 2 undetermined, 1 village, and 1 bluff shelter were found. The report titled Cypress Creek Watershed Archaeological Site Survey contains specific data for each of the 59 sites indicating type of site, specific location, description, previous excavations, artifacts collected, cultural content, summary, and recommendation. This report is available for review at the USDA, Soil Conservation Service, Auburn, Alabama.

According to the National Register of Historic Places of February 4, 1975 and succeeding monthly supplements the following historic sites are located within the watershed.

Lauderdale County

Florence, Courtview (Rogers Hall, Florence State University) Court Street (6-13-74).
Florence, Karsner-Carroll House, 303 North Pine Street
Florence, Larimore House, Mars Hill Road (11-21-74)
Florence Wesleyan Hall, Florence State University, Morrison Avenue (6-20-74)

Soil, Water, and Plant Management Status

During the period 1964 to 1969 there was a slight decrease in harvested cropland in Lauderdale County. Data from 1969 to 1972 shows about a 20 percent increase in cropland in the county. 14/ 15/ Soybeans were the main crop acreage increase. These changes in the county are representative of the Alabama portion of the watershed. The changes in Wayne County are much less than those in Alabama.

Overall during this period there has been only a slight increase in cropland and pastureland and a slight decrease in forest land.

The Wayne County Soil Conservation District and the Lauderdale County Soil and Water Conservation District were organized in the 1950's by interested landowners to encourage the application of needed conservation land treatment measures. Technical assistance is supplied to these districts by Soil Conservation Service personnel headquartered at Waynesboro, Tennessee and Florence, Alabama and landowners in the development of resource conservation plans and the application of needed land treatment measures. The Lauderdale County S&WCD has a regularly scheduled television program in Florence. The program informs landowners and operators about conservation services that are available and of conservation measures that have been applied.

An inventory of both conservation plans and progress reports for farms in the watershed shows that progress is being made in the application of conservation land treatment measures. In August 1973, 205 of the 1,145 farms in the watershed had conservation plans. These plans cover over 17 percent of the watershed. Adequate land treatment has been applied on about 800 acres of cropland and 5,900 acres of grassland by the application of the above conservation practices. It is estimated that about 35,000 acres of forest land and 7,500 acres of idle, urban and miscellaneous lands are adequately protected from deterioration, either naturally or by action of landusers with or without SCS assistance.

The following table lists conservation measures and practices that were planned before August 1973. See table 1A for amounts applied.

LAND TREATMENT DATA
Cypress Creek Watershed

Conservation Practices & Measures	Unit	Planned
Conservation cropping system	Ac.	861
Field border	Ft.	600
Ponds	No.	154
Grassed waterway	Ac.	122
Pasture and hayland planting	Ac.	4,495
Terracing	Ft.	4,250
Wildlife upland habitat management	Ac.	73
Drainage field ditches	Ft.	2,400
Drainage mains and laterals	Ft.	2,650
Pasture and hayland management	Ac.	9,222
Tree planting	Ac.	499
Contour farming	Ac.	319
Crop residue management	Ac.	623

Technical assistance to landowners for planning forestry measures is available from the Alabama Forestry Commission and the Tennessee Conservation Department, Division of Forestry within the going Cooperative Forestry Management Program.

TVA has a resource development program for developing and protecting agricultural resources. This program should continue promoting new ideas and getting helpful information to rural people.

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Land and Water Management

The broad concept of resource conservation has been accepted by a portion of the farmers in the watershed as evidenced by their individual progression applying conservation measures to their lands. It is apparent that many farms are marginal to submarginal as an economic unit due to their small size. The rate of application of land treatment measures on the smaller farming units is slow because the landowners lack the necessary capital and management skills for applying needed treatment. These landowners and operators are more likely to use the land beyond its capabilities. Intensive cropping and high rates of erosion are commonly found on these smaller farms. 1/

Soil erosion has reduced the fertility and water holding capacity of the soil. Soil erosion is most severe on the soils that have greater than one percent, or one foot fall per 100 feet length of slope. The farming of steep slopes has resulted in irregular shaped fields which are not conducive to use of modern farm equipment.

Severe erosion occurs on about 60 acres of roadbanks, field gullies, and borrow pits. Research in Georgia on similar roadbanks indicates that soil losses from erosion range from 25 to 359 tons per acre each year. 2/

The soils of the flood plains have problems resulting from excess water causing: (1) direct damage to cultivated crops by flooding: (2) added expenditures of labor, capital, and energy to re-prepare seedbeds and replant crops: (3) reduced quantity and quality of row crops and pastures and, (4) physical damage to soils.

More efficient uses of labor, capital, energy, and management are needed on farms. Landowners and operators can apply and maintain conservation measures if they can get the money and technical help.

Wildfire on forest lands is a problem throughout the watershed. Wildfires damage timber, wildlife, and other resources. They burn about 1.31 percent of the forest land each year in the Alabama portion of the watershed and about 0.76 percent in the Tennessee portion. An acceptable level is considered to be 0.2 percent.

Floodwater Damage

Damages to crops and pastures on flood plain lands are extensive throughout the watershed. Crops are often destroyed by floodwater, but a significant portion of the damages is related to delayed planting and harvesting with resultant increases in the cost of producing the crop and decreases in crop yields and quality of the product. These damages have forced operators to manage flood plain land well below the actual potential of the soils, resulting in reduced yields and incomes.

Flooding occurs on about 10,321 acres of flood plain land along Cypress Creek and its tributaries, see figure 1. This is the flood plain that would be inundated from a 100-year frequency flood event. At the present time land use in the flood plain is about 19 percent corn, 6 percent cotton, 6 percent soybeans, 45 percent pastureland, 22 percent forest land, and 2 percent idle and miscellaneous.

Frequent floods are severely limiting production in the flood plains. Because of their frequency, the small floods cause more total damage than the large infrequent ones. These floods hinder the production of row crops; and, in some cases, have caused portions of the flood plains (an estimated 600 acres) to be taken out of agricultural production.

Segments of stream channels delay flow because they have restrictions which decrease their widths and depths. These restricted segments are 100 feet to over 1,000 feet long. They consist of trees growing in the channel, large gravel bars, logjams, and dense woody growth. These restrictions reduce channel carry capacities. Some restrictions are causing channel banks to erode or undercut producing downstream sediment.

There are about 320 landowners that suffer floodwater damages annually. There are no residences or businesses in the flood hazard area.

Other agricultural damages occur to about 50 miles of fences, numerous agricultural buildings, drainage ditches, and farm roads. Because of frequent flooding, it is not economical to build fences on parts of the flood plain. Both fence repair and removal of flood debris are necessary several times a year on existing fences.

Nonagricultural damages are significant because of the number of roads subject to damage and the number of people affected when roads are damaged. Some roads are closed several times every year. When roads are closed, it is necessary to reroute traffic. School buses and rural mail deliveries are also affected. Road fill must be replaced.

The flood plain was divided into 26 reaches for evaluation purposes. The extent of flooding is shown in the following tabulation:

Reach	Acres flooded			
	100-yr.	25-yr.	2-yr.	1-yr.
I	282	256	145	74
II	360	351	241	182
III	461	436	338	272
IV	23	22	11	6
V	418	414	362	336
VI	341	324	230	155
VII	642	629	567	531
VIII	353	329	226	175
IX	849	804	535	410
X	176	169	94	43
XI	325	303	215	182
XII	139	135	104	67
XIII	579	561	455	364
XIV	781	706	415	307
XV	288	277	247	157
XVI	358	324	189	139
XVII	189	179	133	101
XVIII	626	593	392	290
XIX	1073	1064	930	593
XX	567	518	253	144
XXI	248	221	143	104
XXII	249	228	155	125
XXIII	134	123	90	75
XXIV	128	122	99	59
XXV	541	481	298	231
XXVI	195	181	149	110
TOTAL	10321	9749	7012	5230

The part of Cypress Creek between the confluences of North Fork and Lindsey Creeks has five to ten damaging floods each year. The rest of Cypress Creek and its tributaries have damaging floods two to five times each year. The average annual area flooded in the watershed is estimated to be 14,155 acres. This figure is an accumulation of the number of acres flooded by flood events during the year and averaged for the evaluation period.

Floodwater on Little Cypress Creek, looking upstream from Rasch Road.

Floodwater on Cypress Creek looking upstream from Cloverdale-Threet Road.

4-34896 4-75

Flooding of this house and adjoining land was caused by Burcham Creek near Cloverdale in March of 1973.

This road was flooded by Burcham Creek near Cloverdale in March of 1973. Note the erosion of the shoulders in the lower left-hand corner.

4-34896 4-75

USDA-SCS-FORT WORTH, TEX. 1975

On March 15-16, 1973, a storm of about 100-year frequency occurred. This storm flooded about 10,000 acres in the watershed. Crop and pasture damages, including sediment and scour, were estimated to be $120,000. Thirty cows drowned in the watershed as a result of this flood and one bridge and two culverts were washed out. A truck plunged into the creek due to the bridge wash out. The two people involved were rescued from the mishap.

Damages from flooding were found to average about $349,300 each year, see table 5. Average annual damages to crops and pastures are about $183,300 and occur primarily in reaches V, VII, VIII, IX, XI, XIII, XIV, XIX, and XXV. Average annual damages to minor fixed improvements (other agriculture) are about $117,100 and occur generally in the same reaches as crop and pasture damages. Road and bridge damages occur mainly in reaches VII, VIII, IX, XIX, and XXV. These average $48,900 each year.

Indirect damages, estimated as a percentage of direct damages, are 10 percent of the agricultural damage, and 20 percent of road and bridge. These damages include delayed shipments of materials and products, loss of wages to employees, increased costs from rerouting traffic, and interruption of public utilities and services. Damages are estimated at $38,700 annually.

Erosion Damage

The present average erosion rates in the watershed by land use is as follows:

	Present Erosion Rate 3/ Tons/Acre/Year
Cropland	14.1
Pastureland	4.0
Forest land	2.5
Idle land	16.1
Misc. land	19.1

The cropland erosion rates exceed the rate which would allow sustained use of the soil resource for agricultural production. These high rates create problems downstream such as streams filling with sediment and sediment deposition on the flood plain. The average permissible rate of soil loss for the majority of soils in cropland is 4 tons per acre annually.

Critical (gully) erosion occurs on about 50 acres of abandoned borrow pits and field gullies. Critical roadside erosion is occurring on about

10 acres. These critical areas are eroding at an average rate of about 240 tons per acre per year.

Flood plain scour has damaged 3,355 acres of the flood plain, reducing the productive capacity of the damaged acres by 5 to 17 percent. Scour damages consist of (1) lowered production where topsoil has been lost and (2) increased cost of farming because the scour channels trap water, encourage weed growth and are difficult to cross with farm machinery. Average annual scour damage is estimated to be $19,700 (table 5).

The general effect of upland erosion on agriculture and the economy of the area was not evaluated in monetary terms, but is considered to be serious and detrimental to the long-range use of the land.

Land eroding at the indicated rates will soon become uneconomical to farm and will be removed from agricultural production or become critical sediment producing areas or both. Either eventuality will have serious deterimental consequences to the economy from loss of production, to the environment from downstream sedimentation and to the aesthetic quality of the watershed.

Sediment Damage

Sediment damage to agricultural and urban lands is minor. Six miles of gravel road that cross the flood plain are frequently overtopped by flooding. Gravel washed from the road is deposited in the road ditches, channels, and adjacent flood plain. This sediment does some damage to croplands and contributes to channel plugging but was not evaluated separately from floodwater damage. Removal of the gravel from road ditches and replacement of the road surface was evaluated as part of flood damage to road and bridges.

Swamping damage is the result of impaired drainage caused by sedimentation in and along channels. Land formerly usable becomes progressively swamped and unfit for the use to which it has been dedicated. Swamping has damaged about 15 acres of flood plain land in the vicinity of the Cooper Branch and Cypress Creek confluence and along the other stretches of sediment plugged channels in the watershed.

Sediment transported by Little Cypress Creek has been deposited in the reservoir formed by Sharp's Mill Dam resulting in an estimated 80 percent loss of reservoir capacity.

The most damaging sedimentation in the watershed is gravel that fills channels and increases the frequency and magnitude of flooding. This

sediment results from the erosion of gravel from roadbanks, road surfaces, gullies, borrow pits, and other exposed areas. Sediment is introduced directly into streams at road crossings and from eroding channel banks.

Small, frequent storms tend to fill ditches and branches and scatter heavy sediment throughout the system, in effect storing the gravel in readiness for the large infrequent storms which move the sediment downstream into the constricted "plugged"areas.

In the vicinity of the confluence of Cooper Branch and Cypress Creek, sediment has accumulated to the extent that "channel plugging" has occurred and flooding takes place after every runoff producing storm (about 25 times per year). In other portions of the watershed channel fill is only partial and flooding is increased in proportion to the channel capacity lost to sediment filling.

The effect of sediment on water quality was not evaluated. Though agricultural chemicals are known to be transported at times by absorbtion on sediment particles, the City of Florence water treatment plant has recorded no serious water quality effect traceable to sediment.

Sediment is deposited in the Tennessee River by stormflows. Based on estimates of erosion in the watershed and the characteristics of the stream, the average annual sediment yield at the mouth of Cypress Creek is about 183,000 tons. An estimated 40 percent of the sediment is sand and gravel which moves as bedload. The remainder which are fine silt and clay is suspended in storm runoff. The average suspended sediment load is estimated to be 332 milligrams per liter. 3/ This sediment concentration is within the range of a fair warm-water fishery stream. 4/

Drainage Problems

Drainage problems in the watershed are minor. Wet areas are producing at only 75 percent of their capability and cover an area of about 180 acres. These areas are presently being used for pasture and consist mainly of the Lee and Lobeville soils.

Other wet areas in the watershed have received protection through the efforts of watershed residents. Practices already installed include 2,650 feet of drainage mains and laterals and 2,400 feet of drainage field ditches.

There is a need to install additional drainage mains and laterals and drainage field ditches to solve the drainage problems. These practices can be applied as part of the landowners conservation land treatment program.

Municipal and Industrial Water Problems

Cypress Creek is the source of water for the City of Florence (population 34,000), and the adjoining rural-residential areas. Total treatment and distribution of water is made by the Florence Water Authority (51,000 customers). The present demand of these 51,000 customers is 5,774,000 gallons per day. Projections for 1990 indicate a demand of 11,548,000 gallons per day for 72,000 people. 5/ At its lowest flow, Cypress Creek furnished about 30,000,000 gallons per day. 6/

Ground water is of adequate quality and quantity for wells throughout the watershed. High yield wells could be developed in the lower portion of the watershed near Cox Creek. Elsewhere, the potential for extensive development of ground water supply is estimated to be low. 7/ There are no plans for water systems which depend on developing ground water.

Recreation Problems

Stream water quality of the watershed is adequate for contact sports, however, developed facilities for these purposes do not exist. An old mill pond known as Sharp's Mill Dam on Little Cypress Creek was developed for swimming with dressing rooms and concession facilities. This development was abandoned some years ago primarily due to sediment accumulation (present maximum water depth--four feet).

Cypress Creek from the Tennessee River up to the junction of Little Cypress Creek is utilized for boat fishing. Streambank fishing occurs around and near many of the road crossings of major streams. Sightseeing and picnicking are enjoyed along the Natchez Trace Parkway and other public roads passing through the watershed.

Even though a variety of nearby recreational resources are available to watershed residents and the general public, recreation resources within the watershed are limited to those mentioned above.

The population within 35 miles of the watershed is about 154,000 and the projected 1990 population is 184,000. 8/

The University of North Alabama is interested in water-related recreation. The University, which has about 4,000 students and 250 faculty and staff members, has expressed a need for water-based instructional and recreational facilities. Enrollment is expected to be 6,500 students by 1980.

With the abundance of nearby water-related recreational facilities available on the Tennessee River and its lakes, there is not an overall need for additional facilities.

Plant and Animal Problems

Land use trends in the watershed are toward slight increases in cropland and pastureland and a slight decrease in forest land. These trends should make no significant changes in plant communities.

Present trends indicate that land and water problems would result in more pasture being converted to cropland in the flood plain and more forest land being converted to grassland in the upland.

Because of sediment and other debris, aquatic habitats in the watershed have been decreasing in quality for at least a decade. This problem was discussed in detail in the Plant and Animal Resources section under invertebrates.

The potentials are medium for both small game and big game hunting in Lauderdale County, Alabama. Potential for waterfowl hunting in the county is low. Lack of habitat limits the potential for waterfowl hunting. 9/ Big game hunting is practically non-existent in Wayne County, Tennessee. The small game hunting available to the public in Wayne County is probably not fully utilized.

Water Quality Problems

Water quality problems in the watershed are minor. Even though there is a slight increase in cropland area, there is expected only minor changes in water quality.

Economic and Social Problems

Lauderdale County, Alabama, is in the Appalachian Region and is eligible for benefits under the Appalachian Regional Development Act of 1965.

About 70 percent of the farms in Lauderdale County have gross sales of less than $2,500 annually. 10/ About 20 percent of the farms in the county are designated by the public Works and Economic Development Act of 1965 as being eligible for assistance. According to the 1969 Census of Agriculture, about 56 percent of the farms in Wayne County, Tennessee, have gross sales of less than $2,500 annually. About 8 percent of the farms in Wayne County have gross sales of more than $10,000 each year.

More employment opportunities are needed in Cypress Creek Watershed. The unemployment rate in Lauderdale County is 5.1 percent 11/ and 5.5 percent in Wayne County. 12/

About 28 percent of the flood plains are in farms that require 1½ man-years or more of hired labor. The remaining 72 percent are in family farms that require less than 1½ man-years of hired labor. 12/

Many residents of the watershed supplement farm income by working in nearby factories, especially in the Quad-City area. A concerted effort in rural community development is needed to increase income and employment opportunities for local watershed residents.

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PROJECTS OF OTHER AGENCIES

There are no water resource development projects planned or being planned by other agencies within the Cypress Creek Watershed.

PROJECT FORMULATION

The application for assistance for the Cypress Creek Watershed was submitted to the Secretary of Agriculture through the Alabama State Soil and Water Conservation Committee (designated state agency). The State Committee reviewed the application and recommended that the Soil Conservation Service furnish planning assistance.

A request for planning authorization was made to the Administrator of the Soil Conservation Service in May 1966. Planning authorization was granted in April 1967. Various federal and state agencies were notified immediately of this authorization and a request for their assistance in planning the project.

During the planning of the project, close cooperation was maintained with these agencies. Approximately 35 meetings were held with interested agencies, the sponsors, and local interest groups during the period of plan development. Alternatives suggested by organizations and individuals were considered in developing the plan.

On June 9, 1971, representatives of the Soil Conservation Service, U. S. Fish and Wildlife Service, and the Alabama Department of Conservation and Natural Resources made a joint field review of the lower reaches of Cypress Creek to consider alternatives to the proposed channel enlargement. Several floodway proposals were discussed. The group concluded that the existing depth of Cypress creek was not sufficient to permit a floodway to function properly.

An informal field review of the tentative work plan was held on June 15, 1971, at the Lauderdale County Courthouse in Florence, Alabama. All concerned local, state, and federal agencies were invited to this meeting and asked to comment on the work plan. Agencies represented at the meeting were the Lauderdale County Soil and Water Conservation District, the Wayne County Soil Conservation District, the Cypress Creek Watershed Conservancy District, the U. S. Fish and Wildlife Service, the Alabama Department of Conservation and Natural Resources, the Alabama Forestry Commission, the U. S. Forest Service, and the Soil Conservation Service. In addition, several interested landowners and members of local sportsmen's organizations attended the review.

A public information meeting was held on July 14, 1971, in Cloverdale School, Cloverdale, Alabama. Major topics discussed were new guidelines for planning and review of channel improvement, ("Guidelines for Planning

and Review of Channel Improvement", SCS Watershed Memorandum 108, February 4, 1971) and environmental impact statements as required by the National Environmental Policy Act (NEPA) of 1969.

Because of significant changes in the planned project brought about as a result of NEPA, a second public meeting was held on September 25, 1973. This meeting was attended by about 26 persons representing state and federal agencies, groups, and individuals. The planned project was explained and questions answered.

The watershed is within the Tennessee-Elk Subarea of the Tennessee Water Resource Region. There are 14 PL-566 projects (installed, approved, or potential) in the subarea but only two, Cypress Creek and Spring Creek (in Colbert County, Alabama), are tributaries to the portion of the Tennessee River below Wilson Dam. This part of the river is the only part of the region that will be measurably effected.

Cypress Creek Watershed and Spring Creek Watershed (proposed project - Colbert County, Alabama) together comprise about one percent of the drainage area of the Tennessee River at Tuscumbia.

Objectives

Meetings were held with the sponsors to discuss their problems, possible solutions, watershed resource development needs, and the formulation of project objectives.

The objectives selected were those that would contribute to the conservation, development, and productive use of the watershed soil, water, and related resources so that the watershed residents may--improve their standard of living through community improvement and adequate income; conserve and protect the natural resources for future generations; and to improve mans environment in which to live, work, and play.

The goals for the project are:

1. To use the land within its capabilities and the establishment and maintenance of necessary land treatment measures which will reduce soil loss to a rate that will permit a high level of productivity to be sustained economically and indefinitely.

2. Provision of a level of protection which will reduce floodwater, erosion and sediment damages to a rate which will allow the productivity

of the land to be sustained economically and indefinitely. The landowners stated that they plan to convert more of the flood plain into cropland and pastureland with flood protection. They also indicated that they plan to manage the flood plain lands at a higher level since the threat of flooding and damages will be reduced.

3. Preservation, improvement and the minimizing of adverse effects to the fish and wildlife resources.

4. Stimulation of the economic development of the area as a result of project installation.

It was agreed that these objectives and goals were reasonable and consistant with water and related land resource conservation and development.

Environmental Considerations

The sponsors considered the environmental impacts, both favorable and adverse, in developing the plan for meeting the project objectives. The sponsors recognized that a certain amount of land would need to be committed to the project. The structure sites were selected and structures were planned to minimize adverse effects to farming operations, transportation networks, utility lines, fish and wildlife habitat, etc., as much as practical. Multiuse plants will be used in vegetating the structures, disturbed areas, and idle areas around the sites to prevent erosion and for use by livestock and wildlife. Based on experience on similar structures in nearby watersheds, it is not anticipated that any health or water quality problems will arise at any of the sediment pools of the floodwater retarding structures. The sponsors do not plan to provide public access to any of the structures and will discourage landowners from using any waters created by the project for incidental recreation until sanitary facilities meeting local and state health requirements are installed.

Initial planning considered channel work on most of the streams in the watershed. The sponsors recognized the channel work would provide additional economic returns but would have adverse effects to the environment. Also, they recognized it was not fully in keeping with their goal of preserving and improving the fish and wildlife resources. All planned channel work was therefore selected on the basis of minimizing adverse effects to the environment but still meeting the goals of the project.

Financial and relocation advisory assistance will be furnished to the people and farming operations displaced by installation of the project.

Land treatment measures planned for the watershed are those that will contribute directly to the preservation and enhancement of the environment in the watershed. Emphasis will be given to those measures which will reduce soil and water losses, assure proper functioning of the structural measures, reduce flooding, and preserve and improve the habitat for the existing fish and wildlife resources of the watershed.

Alternatives

The alternatives to the proposed project that were considered are:

(1) Accelerated Conservation Land Treatment Measures.

(2) Accelerated Conservation Land Treatment and Flood Plain Zoning.

(3) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, and Flowage Easements.

(4) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, and 50.3 Miles of Channel Excavation.

(5) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, 11 Miles of Channel Excavation, and 45 Miles of Channel Clearing and Shaping.

(6) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, 11 Miles of Channel Excavation, and 7 Miles of Channel Clearing and Shaping.

(7) No Project.

The alternatives are described as follows:

(1) Accelerated Conservation Land Treatment Alone

This alternative consists of applying conservation land treatment measures and critical area treatment as proposed in the project action measures. These measures would be applied and financed by the local landowners with technical assistance being provided by the Soil Conservation Service and the Forest Service.

The alternative would reduce flood damges by an estimated four percent or by $9,500 annually. Sheet erosion and sediment yield would be

reduced by an estimated 10 percent. Stream channel aggradation would be reduced by 60 percent, and suspended sediment would be reduced from 332 mg/l to 299 mg/l. Other impacts of land treatment are described in the "Environmental Impact" section. Flood damage reduction would not be sufficient to allow for land use changes or more intensive farming in the flood plain.

The favorable and adverse impacts that would be caused by installation of the structural measures would be foregone. The estimated cost of this alternative is $1,388,700.

(2) Accelerated Conservation Land Treatment Measures and Flood Plain Zoning

Conservation land treatment measures, would be the same as in the proposed action. The implementation of flood plain zoning would offer no further relief to agricultural damages. Flood and sediment damages would continue unchanged. Flood plain zoning would, however, regulate future land use by restricting developments in areas subject to these damages. The estimated total cost of this alternative is $1,595,100.

(3) Accelerated Conservation Land Treatment and 19 Floodwater Retarding Structures

Location of the 19 floodwater retarding structures would be the same as in the proposed project. Conservation land treatment consists of applying land treatment and critical area treatment as in the proposed project.

The floodwater retarding structures would temporarily store the runoff from about 50 percent of the drainage area above the confluence of Cox Creek and Cypress Creek. This alternative would reduce peak flood flows downstream providing for an overall reduction of 59 percent in average annual acres flooded. Floodwater retarding structure impoundments would provide added fishery habitat for the watershed.

Prolonged flooding due to insufficient channel capacities to carry the low stage release rates of the structures would be experienced on about 3,220 acres. Land use changes to less productive uses that could with stand prolonged flooding would be needed. These changes to a lower value production unit would reduce income, lower land values, and probably force some marginal farmers out of business. Prolonged flooding on the 3,220 acres would not allow intensification of farming or any changed land uses to a higher value. In affect this alternative would induce damages on about 30 percent of the flood plain due to prolonged flooding.

Land required for installation of this alternative would be 2,125 acres for floodwater detention pools. Dams, spillways and borrow areas would

require 420 acres. Of these totals 367 acres of forest land would require clearing which is an adverse affect on wildlife habitat. The sponsors would have to obtain flowage easements on the 3,220 acres subject to prolonged flooding.

This alternative would cost an estimated $8,967,400. This consists of $1,388,700 for land treatment, $6,934,900 for floodwater retarding structures and $643,800 for flowage easements.

(4) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, and 50.3 Miles of Channel Excavation

Conservation land treatment and location of the 19 floodwater retarding structures would be the same as in the proposed actions.

The 50.3 miles of channel excavation consists of: Cypress Creek from its junction with Little Cypress upstream to the Natchez Trace Parkway; Middle Cypress Creek from its junction with Cypress Creek upstream through Alabama and about one mile into Tennessee; Burcham, Lindsey, Threet, and North Fork Creeks from their junctions with Cypress Creek upstream to the Natchez Trace Parkway; Bruton Branch from the parkway downstream to Burcham Creek; Dulin Branch from its junction with Cypress Creek upstream to Alabama Highway 157; the lower one mile of Spring Branch; and four reaches averaging about 1½ miles each along Little Cypress Creek. The reaches on Little Cypress are located near; junction with Cypress Creek, Alabama Highway 157, Zip City, and Alabama/Tennessee state line.

These measures would result in an 84 percent reduction in flood damages and an average annual sediment reduction of 47 percent at the mouth of the watershed. Damages to fish and wildlife habitat would occur as a result of channel excavation through removal of trees along the streambanks, increased water temperature, increased sediment and turbidity during and immediately following construction, and by destruction of pools and riffle areas in the channel bottom.

The construction of alternative 4 would require acquisition of land rights on 4,206 acres. One thousand nine hundred and forty-six acres of this total are forest land, of which 1,137 acres would be cleared for construction of channels and floodwater retarding structures. This clearing would affect the wildlife dependent upon forest land for cover, food, and travel lanes. The remaining forest land in the detention pools would receive periodic flooding. The 420 acres required for the dams, spillways, and borrow areas would be lost for crop production. However, the borrow areas could be used for pasture, forest land, and wildlife habitat. The 308 acres occupied by the proposed new channel would be lost for any future production. A travel way for maintenance and inspection would require 242 acres, which could be used for pasture, crops, and/or wildlife habitat.

This alternative would cost an estimated $10,270,800. This consists of $1,388,700 for land treatment, $6,934,900 for floodwater retarding structures, and $1,947,200 for channel work.

(5) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, 11 Miles of Channel Excavation, and 45 Miles of Channel Clearing and Shaping

Conservation land treatment and location of the 19 floodwater retarding structures would be the same as in the proposed action.

The 11 miles of channel excavation and 45 miles of channel clearing and shaping (total 56 miles) would be along the same reaches of streams as described in Alternative (4) for the 50.3 miles. The increased length is due to clearing and shaping work following the existing channel alignment whereas channel excavation work involves major re-alignment.

Channel clearing and shaping, and new channel excavation for this alternate would be performed in the same manner as described in the planned project.

This alternative would provide 77 percent reduction in flood damages. The 11 miles of channel excavation would cause damage to fish and wildlife habitat. This damage would be of the same nature as that of Alternative 4. Land use changes associated with structures and channel work were not calculated, but they would be about the same as those of Alternative 4. This alternative would cost an estimated $9,620,400. This consists of $1,388,700 for land treatment, $6,934,900 for floodwater retarding structures and $1,296,800 for channel work.

(6) Accelerated Conservation Land Treatment, 19 Floodwater Retarding Structures, 11 Miles of Channel Excavation, and 7 Miles of Clearing and Shaping

Conservation land treatment and location of the 19 floodwater retarding structures would be the same as in the proposed action.

The 11 miles of channel excavation consists of: portions of Cypress Creek in the vicinity of Cypress Inn, Salem Church and Cloverdale; the lower ¼ mile of Threet and North Fork Creeks and Dulin and Latham Branches; one mile of Little Cypress above Alabama Highway 157; and Middle Cypress between Bethel Berry and Bethel Grove Churches. The 7 miles of clearing and shaping would involve: about 2 miles of the lower portion of Burcham Creek; one mile of Cypress Creek near Wesley Chapel; one mile each of Middle Cypress Creek and Springs Branch near Cloverdale; and ½ mile of Little Cypress Creek below Alabama Highway 157.

This alternative would reduce average annual flood damages by about 74 percent. Fish and wildlife habitat along the stream would be damaged by the removal of trees along the channel banks, increased sediment and turbidity during and immediately following construction, and by destruction of pools and riffle areas in the channel bottom.

Forest land cleared for construction of dams and channels would be lost for wildlife travel lanes, flood source, and cover. The permanent pools of the dams would provide additional habitat for fish. Land use changes associated with structures and channel work were not calculated, but they would be about the same as those of Alternative 4. This alternative would cost an estimated $8,885,600. This consists of $1,388,700 for land treatment, $6,934,900 for floodwater retarding structures, and $562,000 for channel work.

(7) No Project

This would limit the application of land treatment measures to the present on-going program. The present rate of conservation planning for land treatment is approximately 22 percent of the total amount proposed in the other alternatives.

Flooding would continue, resulting in floodwater and erosion damages.

The deterioration of the cultivated flood plain soils by scour would continue until the cumulative effect of this damage forced land use conversion to less productive uses.

The need to use 3,472 acres of land to construct the structural measures and the resultant impacts would be eliminated.

The creation of 521 acres of surface water which could be used for fish and wildlife will be foregone.

The need to modify 14.4 miles of stream channel and the resultant impacts would be eliminated.

The opportunity to realize about $933,050 in average annual net benefits would be foregone.

The sponsors considered each alternative in their decision making process. Alternative 4 was the selected plan a few years ago but the passage of NEPA and the emphasis on minimizing adverse effects to the environment necessitated further planning. The sponsors believed that some channel work was necessary since the streams are partially or completely filled with gravel.

The sponsors chose the selected plan over all alternatives because it would; meet their objectives, be the least destructive to the environment, be the easiest to install, and be the least costly to operate and maintain after construction.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Conservation land treatment is a basic element in a watershed program. It is defined as applying management, cultural, and structural practices in such a manner that the land is used within its capabilities and soil losses from erosion are held to acceptable levels. Land treatment is accomplished primarily through the development and implementation of conservation plans and forest management plans on individual farms.

Technical assistance to landowners and landusers will be available from the Soil Conservation Service (SCS) through the Lauderdale County Soil and Water Conservation District in Alabama and the Wayne County Soil Conservation District in Tennessee. Technical assistance will be available for soils surveys, conservation planning, implementing conservation plans, and guidance in maintaining conservation measures and practices after application. 1/

Soil surveys are the basic inventories used in developing land use and treatment alternatives. 2/ SCS provides technical assistance in preparing the soil surveys needed for planning and applying land treatment measures.

A soil survey is complete for Lauderdale County, Alabama. It is scheduled for publication in 1976. Until then, soils information is available from the SCS field office in Florence, Alabama.

A complete soil survey has not been made in the Wayne County, Tennessee, portion of the watershed. Soil maps have been made for most of the units of land that have conservation plans with the Wayne County Soil Conservation District. Technical assistance will be provided by SCS in preparing soil surveys for conservation plans that are to be completed during the 10-year watershed installation period. It is expected that soil surveys will be needed on 30,000 acres of Wayne County, Tennessee, during the 10-year installation period.

Conservation plans are documents to guide deliberate actions in accomplishing land treatment. 3/ Conservation planning involves using inventories for studying, evaluating, and selecting alternatives for courses of action. Conservation plans are tailored for particular units of land by the landowners or landusers with the help of the SCS soil conservationist. 4/ The soil conservationist provides technical material and information that are needed in making decisions on soils, water, animals, plants, and related resources. Landowners and landusers make the decisions.

Conservation plans outline appropriate uses for each acre of land and the conservation measures and treatments needed for sustained production and protection. 5/ The landowner makes arrangements to implement the plan. The SCS, upon request, provides technical assistance in installing the conservation practices. This assistance normally involves site investigation, design, layout and supervising the construction of farm ponds, drainage ditches, terraces, diversions, waterways, and other structural practices. Less complex practices such as contour farming usually require only minor surveys for layout work.

SCS also provides technical assistance in maintaining practices after they are applied. This assistance usually involves only consultation and minor surveys. Technical assistance is provided to landowners and landusers throughout the watershed.

Land treatment which results from the technical assistance provided in planning and applying conservation practices is entirely voluntary on the part of landowners and landusers. It is expected that during the 10-year installation period, 477 new plans covering about 57,000 acres will be made and that 81 of the existing plans will be revised.

Conservation land treatment is expected to be applied on 6,000 acres of cropland and 10,050 acres of grassland by the end of the installation period. These amounts represent almost nine times as much cropland and almost two times as much grassland as are presently treated. Conservation land treatment is planned on 170 acres of wildlife land.

Conservation land treatment, except for severely eroded critical areas, was not planned for exact locations when formulating the watershed work plan. Critical areas causing severe downstream sedimentation were delineated and located in figure 4.

Conservation land treatment can be accomplished by applying a combination of practices that are suited to the soil, to land use, and to the landuser's desires. Different combinations of practices can be applied on similar soils. Many conservation practices are used in land treatment. However, past experience and present trends indicate that about ten major practices will be most significant in accomplishing the land treatment program.

The Alabama Forestry Commission and the Tennessee Division of Forestry, cooperating with the U. S. Forest Service, will provide technical assistance on forest lands in the watershed. Conservation practices are expected to be applied on 5,700 acres of forest lands during the 10-year installation period. They are tree planting--2,000 acres and stand improvement--3,700 acres. Cooperative forest fire control will be improved on all forest land in the watershed.

Public Law 566 funds will be provided to assist in accelerating technical assistance, and purchasing one fire fighting truck with removable pumper equipment. The truck and equipment will be operated by the Alabama Forestry Commission. A fire contactor program will be initiated in Tennessee. Landowners or landusers will furnish other tools, equipment, and money which are necessary for treatment of their forest lands.

Conservation practices anticipated to be applied on portions of the 6,000 acres of cropland, 10,050 acres of grassland, 5,700 acres of forest land, and 170 acres of wildlife land during the installation period are:

Diversions
Grassed waterways
Field borders
Conservation cropping systems
Drainage field ditches
Drainage mains and laterals
Pasture and hayland planting
Forest land management
Tree planting
Stand improvement
Intensified fire protection
Ponds
Wildlife upland habitat management

The total amount applied will be contingent upon decisions of landowners and operators. Additional practices will be applied to areas that are not considered adequately treated. Conservation practices will be applied on sloping, upland croplands primarily to reduce soil erosion and water losses from surface runoff. 6/

Diversions will be applied to reduce the slope of fields and to collect and safely remove water. They are often used near the base of steep slopes to protect less sloping cropland below.

Grassed waterways are natural or constructed water outlets that are established in perennial sod-forming vegetation. They provide safe disposal of concentrated runoff water from fields, diversions, terraces, and other structures.

Field borders are strips of perennial vegetation at the edges of fields. They are effective in trapping sediment from row crop fields, reducing runoff water, facilitating the use of farm equipment, and providing food, shelter, and travel lanes for wildlife.

Conservation cropping systems are combinations of cultural and management measures that are effective in maintaining good soil conditions and in reducing soil and water losses. They include the use of sod crops in

rotation, especially on soils that are subject to high rates of erosion. Conservation cropping systems protect flood plains from scour during flooding.

Conservation practices will be applied on croplands in the flood plains primarily to reduce water damages to crops and to facilitate field operations. 6/

Drainage field ditches and drainage mains and laterals are open ditches constructed to designed grades and sizes. Their purposes are to dispose of excessive surface or subsurface water, intercept ground water, or control ground water levels. Excessive ponded water or ground water interferes with tillage, planting, and harvest operations.

Conservation practices applied on grassland will result in rapid protective cover on the land, provide livestock water, and high quality hayland grazing for livestock.

Pasture and hayland planting is the establishment or re-establishment of fields to long-term stands of forage plants. The purposes of these practices are to reduce erosion, to improve the composition of pasture and hay plants, and to use the land within its capabilities.

Pasture and hayland management includes management and cultural measures that result in proper treatment and proper use of pasture and hayland. Its purposes are to prolong the life of desirable forage, maintain or improve the quality and quantity of forage to prevent soil erosion, and to reduce water losses.

Ponds are made by building dams across watercourses or by excavating pits. Ponds provide water for livestock and for fish and wildlife.

Wildlife upland habitat management includes retaining, creating, and maintaining wildlife habitat on uplands. This practice includes management techniques for both game and non-game animals. For example, an area which contains a variety of trees, shrubs, vines, and other plants that provide food, and other needs of wildlife can be retained and managed. Some of the commonly used techniques are planting food plots, retaining portions of agricultural crops, and creating openings in forest land.

Other conservation practices such as minimum tillage may become important before the end of the installation period. If so, they will replace some of the practices discussed above.

About 57 critically eroding areas (see figure 4) covering 60 acres will be stabilized during the installation period. These include about 10 acres of bare, critical roadbanks and about 50 acres of critically eroded gullies and borrow pits.

Critical areas will be shaped to workable slopes and perennial grasses and legumes will be established on them. These will include sericea, common bermudagrass, and tall fescue.

Treatment of critical areas will be a cooperative effort. SCS will provide technical assistance in planning and applying the treatment. For gullies and borrow pits, SCS will also provide funds for shaping and for lime, fertilizer, seed, and mulch. Through a cooperative agreement with landowners, the local sponsors will prepare seedbeds; apply lime, fertilizer, and seed; and do the necessary repair. For critical roadbanks, SCS will provide funds for contracting the vegetative work; the local sponsors will do the shaping needed to establish the vegetation.

Tree planting consists of planting both open lands and understocked stands of trees. This practice develops a cover of absorbent litter on the forest floor and reduces runoff and erosion.

Stand improvement consists of operations such as removal of inferior species and cull trees and harvest cuttings. These operations improve hydrologic conditions and create favorable conditions for production and protection of litter, humus, and forest cover.

Forest management plans will be developed on about 5,700 acres of forest land. These plans will be for forest management, wildlife habitat, watershed protection, and environmental enhancement.

Structural Measures

A system of 19 floodwater retarding structures and 14.4 miles of channel work is planned for construction during the 10-year installation period. This system of structures will provide protection to the flood plain lands of the watershed. The location of the planned structural measures is shown on the project map (figure 1).

Floodwater Retarding Structures

Runoff from about 50 percent of the drainage area above the confluence of Cox Creek and Cypress Creek will be retarded by the structures. These structures will store floodwater temporarily and release it at a rate that will reduce downstream flooding.

The total capacity allocated for the anticipated 100-year accumulation of sediment is 5,762 acre-feet. The principal spillways of structures Nos. 9, 13, 18, 19, and 21 will have single-stage risers (see figure 7).

The crest of these principal spillways will be set at the 50-year sediment level except site No. 9 which will be set at the 100-year level. Maximum releases for any storm are about 20 to 26 csm of drainage area. The principal spillways of the remaining structures, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 15, 16, 17, and 20 will have two-stage risers (see figure 8). The crest of the low stage on these principal spillways will be set at the 50-year sediment level.

The maximum low stage release flows will range from 15.8 to 19.3 cubic feet per second per square mile of drainage area controlled (csm). The maximum high-stage release flows will range from 28.7 to 59.5 csm.

The principal spillways for all the structures will be drop inlet type and will operate automatically. All of the structures will have a slide gate in the base of the principal spillway riser. The slide gate will allow the passing of streamflow and storm runoff during construction and the release of impounded floodwater in order to perform maintenance as needed. All structures will be built on yielding foundations with drains in each to provide both internal and foundation drainage.

The total floodwater retarding capacity in the floodwater retarding structures is 31,554 acre-feet. This storage, combined with the principal spillway capacity for all structures, will provide protection to the emergency spillway. The emergency spillways of each structure will function on the average of once in 50 years after construction except for structure Nos. 18, 19, and 20. The emergency spillways of these structures will function less frequent than other structures.

A water level control gate will be installed in structures Nos. 6, 10, 15, 16, 17, 18, and 19 to permit seasonal variation (2 to 4 feet) of the water levels to provide food for wildlife and waterfowl. These gates will require operation by the sponsors. Cool water outlets will be installed in structures Nos. 1, 2, 3, 5, 6, 7, 10, 11, 18, 19, and 21 to maintain stream temperatures as close to before project conditions as possible. These outlets will be ungated, installed on the principal spillway risers and will operate automatically. Technical assistance through the ongoing program of the Soil Conservation Service will be available for assisting in managing the floodwater retarding structures for wildlife.

The dams will be constructed of compacted earth. They will have an upstream berm (see figure 7 and 8) located at the normal pool level to prevent erosion from waves and to increase dam stability. A plunge pool or other type energy dissipator will be installed at the outlet of the principal spillway to reduce the energy of the water to a non-erosive velocity before it enters the downstream channel. Each structure will have an earthen emergency spillway which will pass flow in excess of detention storage capacity and planned principal spillway releases. Sediment pools and shoreline depths are to be deepened to meet State Health Department regulations for vector control. Other state laws pertaining to impoundments will be followed.

Preliminary site investigations indicate that all needed borrow for the embankments should be obtainable from the emergency spillway areas and from within the sediment pool areas. The borrow materials are generally inorganic silts (ML's), silty-sands (SM's), silty gravels (GM's), and clayey gravels (GC's). If secondary borrow areas are needed they will come from the shoreline deepening areas.

Installation of the floodwater retarding structures will require 3,066 acres of land. This area consists of 1,152 acres of forest land and 1,914 acres of pasture and row crops. Construction of the dams and emergency spillways and the borrow areas will require 420 acres of this land, which includes 159 acres of forest land and 261 acres of pasture and row crops. The sediment pools, which will initially impound water, will inundate 521 acres, which includes 208 acres of forest land and 313 acres of pasture and row crops. The retarding pools will temporarily inundate 2,125 acres, which includes 785 acres of forest land and 1,340 acres of pasture and row crops.

The areas needed for construction of the dams, emergency spillways, and borrow areas will be cleared of all existing vegetation. In addition, woody vegetation within the sediment pool areas below the elevation of the lowest stage of the principal spillway riser will be cleared to the amount needed for the adequate and safe performance and operation of the floodwater retarding structures and to create a practical and reasonable maintenance condition. The precise area to be cleared will be determined during the installation phase at each site. The dams, emergency spillways, and all disturbed areas, except water impoundment areas, will be vegetated with adaptable multiuse plants for erosion control and wildlife use (see figure 10).

The following alterations, modifications, or change in locations of existing improvements will be necessary: (1) either raising or rerouting of county roads in flood pools of structures Nos. 9, 11, 13, and 20, (2) either raising or relocating utility lines near structures No. 9, 11, 12, 13, 16, and 20, and (3) removal of abandoned houses, barns, or sheds near structures No. 13, 16, 20, and 21.

Under present conditions the acquisition of land rights needed for installation will result in the following displacements: (1) Site No. 2 will require relocation of an owner-occupied trailer, which will displace three people, (2) Site No. 3 involves the relocation of one person in a tenant-occupied home. The house is a small frame structure with no bath and no running water, (3) Site No. 6 will require the relocation of a cabinet shop business which is located on a farm, (4) Site No. 9 will require the relocation of two people from an owner-occupied home. The home is a weather boarded, two-story structure

with one bath, (5) Site No. 13 will require relocation of a hog farming operation. Displaced facilities include a lagoon, holding pen, farrowing stall, and one "feed-out" barn, (6) Site No. 16 will require relocation of a tenant house. This is a small frame house with one bath, (7) Site No. 20 will require relocation of five people in an owner-occupied frame house with one bath, (8) Site No. 21 will require relocation of a fish farming operation. Involved are five surface acres of catfish ponds and a rainbow trout raceway.

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the structure sites; to provide for flowage of water in or upon or through the structures; and to provide for the permanent storage and temporary detention, either or both, of any sediment or water.

The environment will be protected from soil erosion and water and air pollution during construction. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil erosion and water and air pollution during construction. Excavation and construction operations will be scheduled and controlled to prevent exposure of excessive amounts of unprotected soil to erosion and the resulting translocation of sediment. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Motors of construction equipment will be required to have mufflers to reduce noise. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or by controlled burning, as applicable.

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities being injuriously adjacent to live streams, wells, or springs in conformance with federal, state, and local water pollution control regulations. Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

The environment will continue to be protected from erosion and water pollution following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with a specific operation and maintenance agreement. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution.

The sediment pools of all floodwater retarding structures are expected to hold water. The sponsors will prohibit access by the general public at each reservoir unless or until adequate sanitary facilities complying with state health laws are provided.

Table 3 shows details on quantities and design features of the structures.

Channel Work

A combination of bedload removal, clearing and shaping, and new channel excavation is planned on 14.4 miles of major streams in the watershed (see figure 1 and table 3A). Removal of bedload in three reaches of Cypress Creek (5.9 miles) and one reach of Dulin Branch (.4 miles) will provide the planned capacity to carry flood flows. Clearing and shaping in three reaches of Middle Cypress (5.0 miles), one reach of Little Cypress (0.8 miles), and one reach of Cypress (1.7 miles) will allow these channels to carry the planned capacity. New channel excavation on Threet (0.3 miles) and North Fork (0.3 miles) Creeks will connect those laterals with Cypress Main at points further upstream from present confluences. This will eliminate the need for channel work on approximately 2 miles of existing channel.

Flow conditions of the 14.4 miles of planned channel work are perennial. Approximately 0.4 miles of planned channel work is on Dulin Branch, a stream previously modified by man in 1954. The remaining 14 miles are natural channels on Cypress, Middle Cypress, Little Cypress, North Fork and Threet Creeks. The present flow of these channels is obstructed by fallen trees, gravel bars, deep bedload, and other debris. These obstructions limit the channels' ability to carry planned flood flows. Therefore, the type of obstruction determines the method of channel work for obtaining planned capacities.

Streambanks throughout the watershed are composed of silt and coarse gravel. In the areas of channel work, the upper one-third of the bank is primarily silt and the lower two-thirds is primarily silty gravel. Streambeds throughout the watershed are composed of coarse gravel. Cypress Creek near Cloverdale, the lower reaches of Middle Cypress, and Dulin Branch are either partially or completely clogged with gravel. There are occasional rock ledges and shoals in all the channels.

Bedload removal will be performed in portions of evaluation reaches II, III, V, and VII on about 6.3 miles of Cypress Creek and Dulin Branch (see figure 1).

Bedload is the loose sand, gravel, and cobbles that have accumulated and are being transported within the channel. This material has clogged the channel and materially reduced the carrying capacity of the stream.

Bedload will be removed with a minimum disturbance to the streambank and trees (particularly the Baldcypress) along the existing channel (see figure 9). Work will be accomplished in segments about ¼ mile long separated by undisturbed reaches of about the same length. About three access points will be needed in each work segment. Each access point will be cleared, as needed, but not more than 200 feet of bank along one side of the channel.

The first segments excavated will be those furthest downstream where the greatest bedload accumulation occurs (Phase 1). The remaining segments will be excavated within 1 to 2 years (Phase 2). During the second construction phase, repair of unstable areas and excavation of the bedload that has accumulated and is causing problems in the first excavated segments will be accomplished.

Construction equipment will enter and exit the channel only at the designated access points. Bedload material will be loaded directly into this equipment and hauled from the channel at access points or pushed to the access points where it will be dipped out with a dragline. Existing roads and open areas will be used where possible to minimize clearing. Access roads to the work segments will be constructed as necessary.

Where more than one channel exists in a given reach, the one requiring the least environmental disturbance will be selected for improvement. Clearing of trees will be held to a minimum. Existing openings, sloughs, and other depressions will be used for spoil disposal. The sterile, coarse, cobbly, gravelly spoil material will be placed in excavated trenches and covered with topsoil. The disturbed areas will be shaped and vegetated (see figure 9).

Clearing and shaping will be performed in portions of evaluation reaches VIII, IX, XI, XIII, and XXV on about 7.5 miles of Middle Cypress Creek, Cypress Creek and Little Cypress Creek (see figure 1). Segments which do not have sufficient capacity will be cleared and shaped within banks and areas disturbed during construction will be shaped and vegetated or otherwise protected to reduce downstream sediment and assure stability.

There are segments, totaling approximately 2 miles, within the 7.5 miles of streams planned for clearing and shaping which have adequate capacity. These segments will not be disturbed except for stabilizing channel banks with riprap as needed.

Clearing and shaping will follow the existing channel alignment and will be done by using chain saws, wenches, front-end loaders, scrapers, backhoes, and other conventional equipment. The exact location and work to be done will be determined during final design. Sand and other mineral spoil removed will be disposed of by burying and revegetating the disturbed areas (see figure 9). Woody material will be burned in accordance with federal, state and local laws and regulations.

New channel excavation will be performed in portions of evaluation reaches IV and VI on about 0.6 miles of Threet Creek and North Fork Creek (see figure 1). On North Fork Creek work begins about 800 feet downstream from the right-of-way of Natchez Trace Parkway, (station 541+00) and proceeds about 1,000 feet downstream to the point where North Fork Creek turns right and runs parallel to Cypress Creek (station 551+00). At this point new channel excavation will be done for about 600 feet to intersect Cypress Creek at a point about one-third mile above the present confluence of North Fork Creek and Cypress Creek (station 557+00).

The remaining excavation will be done on Threet Creek beginning about one-third mile downstream from Natchez Trace Parkway at the point where Threet Creek turns south and parallels Cypress Creek (station 623+00). At this point, new channel excavation will join and extend to Cypress Creek at a point about three-fourths of a mile above the present confluence of Threet Creek with Cypress Creek (station 641+00). This work amounts to 1,800 feet of new channel excavation. To provide a stable channel in this reach of work a reinforced concrete drop spillway will be installed near the confluence of Threet Creek with Cypress Creek (see figure 12).

The new channel excavation will realign portions of these creeks. After construction, they will flow into Cypress Creek further upstream than at present. The realignment eliminates about 2 miles of channel work that would have been needed if the existing channel had been followed.

Channels will be excavated with draglines, scrapers, or other conventional earth-moving equipment. Spoil from the new channels will be spread and shaped to permit safe mowing and other maintenance (see figure 9). Surface drainage will be by open ditches, spoil openings, rock inlets, and pipes through spoil banks. Pipe will be used where scour is a problem and where needed for maintenance access roads.

Installation of the channel will require 406 acres of land. This area consists of 242 acres of forest land and 78 acres of pasture and row crops and 86 acres of existing channel.

Land required for doing the channel work includes 186 acres for bedload removal; 210 acres for clearing and shaping; and 10 acres for new channel excavation. Channel work will not require relocation of existing improvements.

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the channel work. Project sponsors will operate and maintain the channel work in accordance with a specific operation and maintenance agreement. The agreement will set forth the inspections to be made and the maintenance to be performed.

The environment will be protected from soil erosion and water and air pollution during construction in the same manner as described for the floodwater retarding structures in the previous subsection.

The proposed channel work has a potential for the destruction of some habitat of the slackwater darter which is a candidate for protection under the Endangered Species Act of 1973. The final plans and specifications for the channel work will include measures to preserve the habitat of the darter or mitigate the loss of habitat. Plan elements will be based on a detailed study of the habitat requirements of the slackwater darter and will be coordinated with the U. S. Department of the Interior.

Should any archaeological or historical sites be discovered during and as a result of the installation of structural measures, construction will be stopped. The Secretary of the Interior (National Park Service), the Curator of Anthropology, and the Historical Preservation Officer will be given an opportunity to evaluate the sites and make recommendations for salvage or mitigation before construction continues. Also, the Advisory Council on Historic Preservation will be afforded an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties." Since this is a federally assisted local project, there will be no change in the existing responsibilities of any Federal agency under Executive Order 11593 with respect to archaeological and historical resources.

REFERENCES CITED

1/ The Soil Conservation Service, SCS-CI-17, U. S. Government Printing Office, May 1969.

2/ Know Your Soil. Agricultural Information Bulletin 367, August 1970. Washington D. C.: Government Printing Office.

3/ Principles and Concepts of Planning. National Handbook for Resource Conservation Planning. Washington D. C.: United States Department of Agriculture, Soil Conservation Service, July 1971.

4/ What Is a Farm Conservation Plan? United States Department of Agriculture, Soil Conservation Service Pamphlet 628, October 1965. Washington D. C.: Government Printing Office.

5/ America's Conservation Districts, National Association of Conservation Districts, League City, Texas.

6/ National Handbook of Conservation Practices, USDA-SCS, July 1971.

EXPLANATION OF INSTALLATION COSTS

Land Treatment

The total estimated cost of all conservation land treatment measures within the watershed is $1,388,700 (see table 1). The PL-566 portion of this cost is $257,700 and the "Other" cost or local sponsors cost is $1,131,000.

The total estimated installation cost of conservation land treatment, excluding forest land treatment, is $1,070,700 of which $193,500 will be PL-566 funds and $887,200 will be Other funds. PL-566 funds will provide $178,400 for accelerated technical assistance ($162,400 for Soil Conservation Service and $16,000 for Forest Service) and $31,100 for planning and application of needed critical area land treatment measures during the 10-year installation period. This cost of planning and application includes materials such as lime, fertilizer, seed, and some shaping needed to stabilize the areas. The sponsors cost of $18,600 is the estimated value of the work necessary to install the critical area measures. All costs of non-critical area land treatment measures, except technical assistance, will be borne by the landowners and operators with such assistance as may be available under other on-going programs.

The landowners will finance the $147,900 for applying the forest land treatment measures ($93,200--Alabama, $54,700--Tennessee with such assistance as may be available). PL-566 wil provide $48,200 for forest fire control. Of this cost $46,200 is to provide a fire contactor program during the 10-year installation period and $2,000 is for a truck with removable pumper equipment.

The "Other" cost of fire control ($88,700) is the state's share of the contactor program and acceleration of capital outlay ($17,300), state's share of truck with removable pumper ($2,000), and cost of the ongoing Cooperative Forest Fire Control Program ($69,400).

Funds are estimated to be obligated by year for applying the conservation land treatment measures as follows:

Project Year	PL-566	Other	Total
1	$ 25,800	$ 138,900	$ 164,700
2	25,800	138,900	164,700
3	25,800	138,900	164,700
4	25,800	138,900	164,700
5	25,800	138,900	164,700
6	25,800	138,900	164,700
7	25,800	138,900	164,700
8	25,800	138,900	164,700
9	25,800	138,900	164,700
10	25,500	138,600	164,100
TOTAL	$257,700	$1,131,000	$1,388,700

Structural Measures

The total installation cost of the floodwater retarding structures and channel work is estimated to be $8,199,600 of which Public Law 566 costs area $7,502,600 and other costs are $697,000 (see table 1).

PL-566 funds include $5,109,150 for construction of floodwater retarding structures and $909,650 for construction of channel work. The estimated construction cost includes $8,400 for water level control gates in seven structures and $12,000 for cool water release devices to be installed in 11 structures.

The construction cost includes the engineer's estimate and a 12 percent allowance for contingencies. The engineer's estimate was made by determining the amount or quantity of specific items that will be needed for construction of each individual structure. Such items include, but are not limited to, land clearing, embankment fill, excavation, concrete pipe, concrete, fencing, and vegetation. The unit cost for the specific items was based on actual cost of structural measures in similar areas modified to conditions found in this watershed.

The cost of engineering services is estimated to be $450,500 of which all will be borne by PL-566 funds. Engineering Services include the direct cost of engineers and other technicians for surveys, investigation, design and preparation of plans, specifications for structural measures including the vegetative work, laboratory reports and cartographic services.

Total land rights costs are estimated at $683,800. This cost includes $33,500 for road and bridge alterations, $37,500 for relocation of fixed improvements, and $612,800 for 406 acres needed for channel work and access roads plus 3,066 acres needed for floodwater retarding structures. Value of land, easements, and rights-of-way was estimated by representatives of the local sponsors and concurred in by the Soil Conservation Service.

The project administration cost is estimated to be $1,023,300 of which $1,014,500 will be borne by PL-566 and $8,800 by Other funds. The local costs for project administration include sponsors' costs relative to contract administration, overhead and organizational costs, whatever construction inspections they desire to make at their own expense, incurred costs for administrative duties associated with relocation payments, and costs for relocation advisory assistance services. Estimated costs of $1000 for providing relocation advisory assistance services will be borne entirely by the sponsors.

Public Law 566 costs for project administration include the costs of construction inspection, maintenance of Soil Conservation Service records and accounts, and administrative costs associated with relocation payments incurred by the Soil Conservation Service.

The total costs for apparent eligible relocation payments resulting from displacements that are expected from installation of the project are estimated to be $23,200. All relocation costs will be shared, with Public Law 566 funds providing $18,800 (81.0%) and local funds providing $4,400 (19.0%). Cost sharing percentages are based upon the ratio of Public Law 566 funds and other funds, less relocation payments, to the total project costs.

EFFECTS OF WORKS OF IMPROVEMENT

Flood Prevention, Erosion, and Sediment

Planned project measures will decrease the frequency of flooding significantly. Damages will be reduced by 75 percent. The total watershed acres flooded with and without the project for selected storms are as follows:

Frequency	Acres Flooded Without Project	Acres Flooded With Project
1-year	5,230	1,580
2-year	7,010	3,100
10-year	9,140	5,660
100-year	10,321	7,690

The frequency-elevation-discharges for with and without project conditions are shown below for various locations in the watershed as indicated.

Location - Cypress Creek approximately 1.5 miles above the confluence with Middle Cypress Creek

Frequency	Elevation Without Project	Peak Discharge Without Project	Elevation With Project	Peak Discharge With Project
1-year	525.6	2,150 cfs	524.4	1,250 cfs
2-year	526.2	3,240 cfs	524.9	1,790 cfs
10-year	527.1	6,410 cfs	526.0	3,070 cfs
100-year	528.1	12,190 cfs	526.7	5,260 cfs

Location - Cypress Creek approximately 0.6 mile above the confluence with Little Cypress Creek

Frequency	Elevation Without Project	Peak Discharge Without Project	Elevation With Project	Peak Discharge With Project
1-year	480.8	5,300 cfs	479.5	3,610 cfs
2-year	482.2	7,690 cfs	480.6	5,070 cfs
10-year	485.1	14,630 cfs	482.6	8,680 cfs
100-year	490.0	27,450 cfs	485.3	15,050 cfs

Location - Cypress Creek approximately 0.2 mile below the confluence with Little Cypress Creek

Frequency	Elevation Without Project	Peak Discharge Without Project	Elevation With Project	Peak Discharge With Project
1-year	473.7	7,430 cfs	471.9	4,480 cfs
2-year	475.0	10,570 cfs	472.9	6,280 cfs
10-year	477.5	19,520 cfs	474.9	10,480 cfs
100-year	480.8	35,740 cfs	477.0	17,800 cfs

Location - Middle Cypress Creek 1,500 feet downstream from Highway 157

Frequency	Elevation Without Project	Peak Discharge Without Project	Elevation With Project	Peak Discharge With Project
1-year	547.7	2,110 cfs	546.6	880 cfs
2-year	548.0	2,950 cfs	547.1	1,390 cfs
10-year	548.8	5,390 cfs	547.7	2,500 cfs
100-year	549.6	9,720 cfs	548.4	4,220 cfs

With the project installed, the average annual area flooded will be reduced 70 percent (weighted average). The percent reductions shown on the following page show large variations for the different reaches listed. These variations are due to the floodwater retarding structures providing a high degree of protection from flooding immediately below the structures.

The flood of March 15-16, 1973, which was about a 100-year frequency, resulted in flooding on about 10,000 acres. The planned structural measures would reduce the number of acres flooded by this storm to about 7,700 acres. The protection afforded by the structural measures would eliminate much of the damages to fences, roads, bridges and buildings which resulted from this flood.

Average Annual Acres Flooded by Reaches
With and Without Project

Evaluation Reach Number *	Average Annual Acres Flooded		Percent Reduction
	Without Project	With Project	
I	189	64	66
II	414	185	55
III	601	195	68
IV	15	0	100
V	1,443	198	86
VI	251	9	96
VII	2,238	561	75
VIII	489	34	93
IX	922	156	83
X	111	0	100
XI	603	159	74
XII	139	139	0
XIII	887	372	58
XIV	756	244	68
XV	308	155	50
XVI	389	58	85
XVII	219	67	69
XVIII	588	357	39
XIX	1,555	845	46
XX	412	42	90
XXI	194	16	92
XXII	277	103	63
XXIII	162	9	94
XXIV	127	26	80
XV	630	140	78
XXVI	236	102	57
TOTAL	14,155	4,236	70

* See figure 1 for Reach location

The present, future without project, and future with project land use in the flood plain is as follows:

Use	Present		Future w/o Project		Future w/Project	
	Acres	Percent	Acres	Percent	Acres	Percent
Cropland	3,261	31.6	4,046	39.2	4,436	43.0
Pastureland	4,590	44.5	3,805	36.9	4,017	38.9
Forest land	2,291	22.2	2,291	22.2	1,744	16.9
Idle	55	0.5	55	0.5	0	0.0
Miscellaneous	124	1.2	124	1.2	124	1.2
TOTAL	10,321	100.0	10,321	100.0	10,321	100.0

Future with project condition projects a decrease of 55 acres of idle and 547 acres of forest land with an increase of 390 acres of cropland, and 212 acres of pastureland. The changes in land use projected are expected to occur because of the flood protection from the small frequent floods which result in the most damages to crops grown in the flood plain.

With the flood protection afforded by the planned project crop yields will increase. Below are crop and pasture yields expected in the future.

Crop	Unit	Future Without Project*	Future With Project**
Corn	bushels	77	94
Cotton	pounds	630	825
Soybean	bushels	35	45
Pasture	Animal Unit Months	7	9

* Yields that are expected to occur about 20 years in the future with improved technological practices.

** Yields that are expected about 20 years in the future with improved technology and more intensive land use.

The reduction in flood hazard will allow landowners to utilize resources more efficiently. More intensive use of existing cropland and pastureland will be realized on 7,851 acres. Five hundred and forty-seven acres of marginal forest land are expected to be converted to cropland and improved pasture. Presently there are 55 acres of unproductive land that was previously in agricultural production that was abandoned because of the flood hazard. This land will be restored to its former productivity with the project.

Installation of the 19 floodwater retarding structures will cover 521 acres with water and/or sediment. In addition, 2,125 acres within the flood pools will be subject to periodic flooding and will require a use compatible with such flooding. The present land use of these 2,646 acres is 993 acres of forest land and 1,653 acres of pasture and cropland. Income lost from forest land each year is estimated at $8.00 per acre and income lost from open land per year is estimated at $38.00 per acre. However, the full amount will not be lost on the 2,125 acres since this land will not be permanently inundated by water. There will be a partial loss in income on this land.

Land to construct the dams, spillways, and borrow areas will require 420 acres. Of this total 159 acres are forest land and 261 acres are pasture and row crops. The type forest land to be cleared is mainly lowland hardwoods. Some timber production will be lost by clearing. However, most timber production in the area is from yellow poplar, which is the least dominant species. The hardwoods provide den trees and travel lanes for squirrel, and provide habitat for rabbit, mink, muskrat, and raccoon. The loss of this forest land will have a minor effect on wildlife. The sediment pools and dams of the 19 floodwater retarding structures will inundate 10.2 miles of stream, one farm pond, and one rainbow trout raceway. As previously mentioned, water level control gates will be installed at seven of the floodwater retarding structures. This will help offset the loss of wildlife and waterfowl habitat.

Channel work will require clearing 60 acres of forest land which will remain open and be used for crops, pasture, and wildlife habitat after construction.

Project installation will require a commitment of 343 man-years of local labor to install project measures. Two and 3 tenths man-years of labor will be needed each year to operate and maintain project measures. Additional resources such as equipment, gas, oil, food, and concrete will be committed to project installation. The contractor's capital investment in equipment will be depreciated in value after being used for project installation.

The combined effect of the proposed conservation land treatment and floodwater retarding structures will reduce the amount of sediment deposited in Cypress Creek and its tributaries and the Tennessee River. Land treatment measures will reduce sheet erosion, and the floodwater retarding structures will provide for 5,762 acre feet of sediment storage (see table 3). Land treatment measures will reduce average sheet erosion rates from 5.6 tons per acre per year without the project to 5.1 tons per acre per year with the project. Critical erosion;

gullies, borrow pits, and roadbanks, will be reduced by 95 percent from an average of 240 tons per acre per year to about 5 tons per acre per year. Since runoff from pastureland is less than that from cropland and forest land then the water quality of the streams should improve with a decrease in sediment entering the streams.

Land use changes expected in the watershed as a result of the project installation are:

LAND USE	PRESENT (AC.)	FUTURE W/PROJECT (AC.)
Cropland	15,947	15,258
Pastureland	25,046	27,309
Forest land	84,992	83,418
Miscellaneous land*	9,375	9,375

* Roadsides, farmsteads, urban, and idle land.

The changes in land use shown above indicate an increase in pastureland and a decrease in forest land and cropland.

Flood plain scour (average annual acres damaged) will be reduced by 70 percent. About 5 percent of this reduction is due to conservation land treatment and 65 percent due to structural measures. These damages (monetary) will be reduced by 57 percent. About 5 percent of this reduction is due to conservation land treatment and 52 percent to structural measures.

The average annual sediment yield from the entire watershed will be reduced from 183,000 tons to 96,000 tons; a 47 percent reduction in sediment. Conservation land treatment alone, on the area downstream from floodwater retarding structures, will account for 13 percent of the 87,000 tons of sediment reduction. A combination of conservation land treatment and sediment entrapment at floodwater retarding structures will account for the remaining 87 percent of the total sediment reduction. Average annual suspended sediment consentration will be reduced from 332 milligrams per liter without the project to 175 milligrams per liter with the project. Conservation land treatment accounts for 21 percent of the reduction in suspended sediment. Structural measures, and land treatment upstream from structures, cause 79 percent of the reduction in suspended sediment. Reduction in suspended sediment concentration will improve the water quality.

Structural measures will benefit 10,321 acres of land in the watershed.

The 320 landowners in the flood plains will receive greater benefits from the installation of the project due to flood protection. In

addition the 35,000 people living in the watershed will benefit from reduced erosion, sedimentation, and increased aesthetic appeal of the area. The FRS should detract little, if any, from the aesthetic appeal of the streams in this watershed considering the fact that only one structure will be constructed on a perennial stream. Also the Quad-City area with a 1970 population of 85,000 will benefit from the expenditure of funds in the area for project installation. Construction materials purchased locally and locally hired labor spending their salaries in the area will have a positive effect on the amount of money in circulation. A general benefit is felt in the public sector due to the tax revenues generated by spending and re-spending part of the original dollar. In addition, structural measures will improve the stream for recreational activities such as canoeing.

Installation of the planned project will provide 75 percent protection against flooding or an average annual benefit of $226,200 to agriculture while nonagricultural flood damages will be reduced 74 percent or $36,400.

The floodwater retarding structures will affect both quantity and quality of stream flow. With the installation of these structures, sediment load will decrease providing higher quality water. The stream will have increased and prolonged base flow by gradual release of floodwater from floodwater retarding structure pools, by seepage from reservoirs, and by water temporarily stored in the flood plain alluvium by bank-full flows in the channels.

The stream is clogged with gravel in segments along the watercourse. These clogged segments will be cleaned out to improve the flow characteristics and capacity of the streams. This work will tend to restore the stream to its natural condition as suggested in the study of potential for wild, scenic, and recreation rivers in Alabama. 1/ However, the project will have very little effect on dry-season streamflow and cannot be expected to return the stream to the same condition that would result from a primeval forested watershed.

Ground water recharge will be increased by about 5 percent because of the conservation land treatment program and floodwater retarding structures. This will not result in a significant rise in ground water levels since ground water is, under present conditions, continually discharging into the stream system.

Analysis of similar channel work of the type proposed for Cypress Creek indicates that the water table will be altered where the water level in the channel is changed. However, the effect is significant only a few

feet from the channel banks. Cypress Creek channel is being deepened only slightly; therefore, the water table will be lowered a few inches within a narrow band alongside the reworked channel.

Chemical pesticides escape into the environment by movement of water, soil erosion, drift, volatilization, and through plant and animal removal. 2/ The small reduction of total watershed cropland, with the planned project implemented, should result in a slight reduction in pesticide use. The installation of conservation practices that reduce soil erosion and runoff water will have a significant effect on reducing the loss of agricultural chemicals from fields. 3/ 4/ 5/

Annual sediment accumulation in Pickwick Reservoir, on the Tennessee River from Cypress Creek, will be reduced by 78 acre feet per year (87,000 tons). The aesthetic appeal of the streams in the watershed will be improved by reduction in sediment load. The Florence water supply system will benefit from reduced sediment.

Conservation land treatment will have a pronounced effect on the aesthetics of the watershed. Establishing vegetation on 60 acres of critically eroded roadbanks, gullies, and borrow pits will result in a more pleasing environment for the people who live in and visit the area. The installation of conservation land treatment practices on upland soils will result in lines, forms, and patterns that are more harmonious with the natural landscape.

Structural measures planned for the watershed will not have a significant impact on the plant communities of the area. 6/ Vegetation along the edges of permanent pools is likely to change to marsh-like conditions with a high composition of water-tolerant plants. This will be more pronounced in the upstream portion of the pool areas. The plant communities in the flood storage areas may change to a slightly higher composition of water-tolerant plants.

Only slight changes in plant communities are expected as a result of channel work. Creek banks that are disturbed will be planted to forage plants. Studies of other modified channels in North Alabama indicate that rice cutgrass (leersia oryzoides), low panicums (Panicum spp.), and knotgrass (Paspalum distichum) often become established near the normal water line. 7/ Willows (Salix spp.) and other water tolerant woody plants often become established on the channel side slopes. No species changes are expected on the undisturbed areas of the flood plain except for the acreage that will change from forest land, pasture, and idle land to cropland. The level of protection provided will not significantly affect growth of water tolerant trees in the flood plain.

Water Supply

The water supply intake for Florence is located about 8 miles downstream from the nearest bedload removal work. Because of this distance and the type of non-plastic material that is being removed, suspended load should be settled out. Even if all the suspended load is not settled out the turbidity caused by bedload removal at the water supply intake would be less than that caused by a small rain. Bedload removal will be done for about 10 hours per day, leaving 14 hours per day with no disturbance. After the total project is installed the sediment load at the water intake will be reduced by about 47 percent. The dams upstream from where channel work is planned will be installed prior to channel construction. These dams will eliminate a good protion of the sediment that would normally be moving downstream.

Installation of 19 floodwater retarding structures will initially impound 521 acres of water. This water can be used for watering livestock, fish production, and wildlife habitat. There is no water supply planned for industrial or municipal use.

Rural domestic water supplies in Cypress Creek Watershed are almost without exception from upland wells or flowing springs that receive water from upland recharge. Shallow flood plain wells are the only ones which might be affected by small local water table change. Overall, ground water recharge is expected to increase because infiltration and water holding capacity will be improved by conservation land treatment and cropping systems.

Fish and Wildlife

The impact of floodwater retarding structures on the immediate area will result from the clearing of existing vegetation in the flood pool and the inundation of 10.2 miles of streams.

Forest land is expected to decrease by about 1,500 acres, of which 536 acres is located in the flood plain. The loss of forest land will result in reduced habitat for some species of wildlife; however, other species that require open land will be benefited. It should be noted, however, that forest land in the watershed is expected to decrease without the project. All but one of the 19 structures will be located on intermittent streams. These floodwater retarding structures will, to some extent, reduce the potential breeding habitat for some andramous fish such as sauger or white bass. There will be no significant impact of the floodwater retarding structures on the utilization of these species for fishing.

Fishing presently occurs downstream from the proposed impoundment sites. The inundation of these intermittent streams will destroy habitat of some mollusks, small fish, amphibians and other wildlife.

Several fish classified as "threatened, endangered, or special concern" will be affected by the project:

Rare-1. Special Concern. Etheostoma blennius (Blenny darter) This fish is endemic to Alabama and Tennessee. Yokley states that this darter is not common in any part of the drainage, but occurs in all the large streams. 6/

Another study conducted by Boschung, University of Alabama, found this darter to be fairly common in Cypress and Shoal Creeks. 8/ Both studies indicated that this species would be harmed or extirpated in areas slated for channel work.

Boschung further stated that this species would be extirpated by impoundments. The distribution of the blenny darter in the area is presented in Boschung's report. The blenny darter is on the federal list of Rare and Endangered Fish and Wildlife of the United States as "Special Concern". Boschung states that this is one of the most vulnerable species in the project area. He found this darter at six localities. This fish exists on Cypress Creek where bedload removal is planned and on Threet Creek where new channel excavation is scheduled. Floodwater Retarding Structure No. 20, on Little Cypress Creek will inundate a large stretch of blenny darter habitat.

Rare-2. Special Concern. Phoxinus erythrogaster (Southern redbelly dace) Studies by Boschung and Yokley found this fish in springs, spring-fed streams and other small headwater streams. Yokley states that this species is most abundant in Burcham Creek and North Fork Branch. Any stream modification resulting in an increase of the water temperature will adversely affect this fish. This species is also intolerant to high silt concentration and inundation. Boschung states that this fish has a small range and will be extirpated in streams slated for excavation and inundation.

Rare-2. Special Concern. Notropis coccogenis (Warpaint shiner) Boschung's studies show that this shiner occupies much of the drainage area. Yokley states that even though this species is intolerant to silt, bedload removal, if done with care, would have only moderate adverse effects. Also, he states that this fish would not be adversely affected by impoundments. Boschung's report states, "Any modification of Cypress Creek that will increase siltation will have an adverse affect on Notropis coccogenis".

Endangered - Etheostoma boschungi (Slackwater darter) Boschung, who described this fish, states that it is known in Alabama only from the Cypress Creek Watershed and from three localities in the Flint River drainage. In Tennessee, this darter is known from the upper parts of Cypress and Middle Cypress Creeks and from one locality in the Buffalo River. Boschung did not find this species in the Little Cypress Creek drainage.

Yokley found the slackwater darter most abundant in Lindsey Creek and North Fork Branch. A few specimens were also collected in Middle Cypress and Burcham Creeks. Boschung indicated that this may be the most restricted species in the Cypress Creek Watershed and would be jeopardized in streams slated for channel work such as cleaning of the stream channel, streambank clearing and shaping and removal of detritus and inundation. This fish apparently breeds during the winter months. Planned features will be included in the final plans and specifications for the channel work to preserve and/or mitigate the loss of slackwater darter habitat.

The following seven fish classified as "Special Concern", would be adversely affected by the proposed project:

Hemitremia flammea - (Flame chub)
Notropis telescopus - (Telescope shiner)
Notropis fumeus - (Ribbon shiner)
Rhinicthys atratulus - (Blacknose dace)
Noturus exilis - (Slender madtom)
Etheostoma jessiae - (Blueside darter)
*Lagochila lacera - (Harelip sucker)

*The Harelip sucker is probably extinct.

Species of wider but relatively smaller ranges that would be subject to extirpation in stream areas to be excavated or inundated are Etheostoma jessiae, Etheostoma rufilineatam, Phoxinus erythrogaster, and Hemitremia flammea.

Boschung found that Little Cypress Creek, especially the portion from the Alabama-Tennessee border to Sharp's Mill Reservoir, provides excellent habitat for the following darters: Etheostoma blennius, E. blennioides, E. caeruleum, E. jessiae, E. rufilineatum, E. simoterum, and E. zonale. Water retarding structure No. 20 will inundate a large portion of excellent darter habitat as well as that of the rock bass, Ambloplites repestris, an excellent game fish.

Additional information concerning the abundance, distribution, and ecology of these fish is available in studies conducted by Yokley and Boschung.

The planned project will also affect fish other than "rare" or "endangered" species. Some of these effects such as reduction in silt, after installation of the project, will be beneficial to the stream fishery. Where channels are completely filled with gravel and debris, channel work will create habitat. Although not designed specifically for fish production, the floodwater retarding reservoirs will create some fish habitat, and impoundment fishery will be increased.

One detrimental effect of stream alteration is the loss in stream length. The planned channel work on Threet Creek and North Fork Creek will divert water from two miles of existing channels. Another adverse effect is the loss of streamside vegetation, cover and shelter for fish. The food supply of some macroinvertebrates will be altered by streambank alteration. About 15 or 16 miles of perennial streams will be altered by impoundments or channel work. Streambank vegetation along the length of channel will be modified to varying degrees. However, only 50-60 percent of the riparian vegetation should be disturbed in work areas. Again, the planned project of bedload removal and clearing and shaping will minimize this effect.

Alteration of an unstable substrate has caused increased sedimentation and siltation on other projects, but the nature of the Cypress Creek channel bottom is such that it will remain stable. Temporary increased sedimentation and siltation caused by construction can be detrimental to the aquatic environment. Other detrimental effects such as increased streambank erosion due to loss of streamside vegetation, loss of basic food material due to loss of streamside vegetation, loss of the aesthetic value of the stream, etc., will be minimal in the planned project because of the use of bedload removal and a minimum of clearing and shaping.

Stream water temperatures are expected to increase slightly in impoundments and immediately downstream due to removal of streamside vegetation and exposure of more water to solar radiation for longer periods. Channel work will only require a minimum amount of stream canopy removal. Eleven structures will have cool water outlets several feet below the water surface. Water temperatures in the stream vary from about 35 degrees in the winter to 80 degrees Fahrenheit in the summer. 11/

Boschung concluded after an intensive study of the Cypress Creek Watershed, that fish habitat will be destroyed as a result of the planned project. The impact of the project will also "reduce certain fish populations making them more susceptible to extirpation and decimation. We do not know of a single species of fish that will be totally eliminated from the watershed as a result of the Soil Conservation Service watershed project; however, conditions of some will be worsened."

There are no rare or endangered amphibians or reptiles in the project area. 6/ 8/ One salamander, Cryptobranchus alleganiensis alleganiensis (Hellbender), classified as "status undetermined" by the Alabama Department of Conservation and Natural Resources may be in the drainage area. Assessments of the fauna in the Cypress Creek project area by Boschung and Yokley did not include an actual collection of the hellbender, but both investigators agree that this salamander could be there. The hellbender is found in Alabama only in the Tennessee River drainage, in rocky tributaries of the river. This salamander is extremely secretive in daily and seasonal activities, and is hard to observe or collect. Yokley states that only the lower portions of Cypress Creek provide ideal habitat so that floodwater retarding structures will probably have little effect on these animals. However, both Yokley and Boschung believe that channel work will destroy the habitat of the hellbender at those sites affected. Yokley predicts that the hellbender could possibly benefit from the project after installation, due to decreased silt conditions.

Mammals, birds, reptiles, and amphibians in the drainage should not be adversely affected by the alterations proposed for flood control," according to Yokley. This report also stated the possibility of some aquatic birds and frogs being benefited by the project. Freshwater mussels will have parts of their habitat destroyed by bedload removal below Sharp's Mill Dam in Little Cypress Creek. Reduction of silt will benefit mussels after the project is installed.

Yokley concluded that the project should have minimal adverse effects and will improve water quality.

Boschung also concluded that the proposed project would have little effect on herptiles with the possible exception of the hellbender. This study also stated that few of the mammals in this area are dependent on permanent bodies of water, but some are and may be affected by the project. Those affected depend to some extent on shellfish for food. The application of 170 acres of wildlife upland habitat management will have a beneficial effect on wildlife. Other land treatment practices such as field borders, grassed waterways, conservation cropping systems, and ponds will improve wildlife habitat.

Some biological control on mosquitoes can be expected from aquatic organisms and avifauna. In addition, FRS are remotely located in relation to human populations so as to minimize undesirable impacts from mosquito problems. Aquatic plant growth will be discouraged in shallow areas by deepening the water line.

The average annual storm will not create flood pools for more than 2 or 3 days. Furthermore, this prevents downstream flooding over a much larger area. The net results of the FRS would be to reduce the favorable mosquito breeding habitat that is dependent on temporary flood waters.

Archaeological, Historical, and Scientific

To determine the effects of the planned project on sites of archaeological and historical significance, an archaeological survey was conducted. A total of 59 sites were located within the Cypress Creek drainage area with 10 of these sites being located in areas which may be disturbed by the proposed structural measures. Six of these sites are located within the areas to be inundated by the floodwater retarding structures. Floodwater Retarding Structure No. 1 will inundate two campsites. Structures Nos. 15 and 18 will each inundate one campsite and Structure No. 20 will inundate one campsite and one bluff shelter. Four sites along streams designated for channel work will be disturbed. One site is on Cypress Creek, two on Middle Cypress, and one is on North Fork Creek. No historical or archaeological sites eligible for nomination to the National Register of Historic Places were found in the watershed.

Economic and Social

The project will serve as a stimulus to the economy by providing new employment opportunities. About 325 new semi-skilled and 18 skilled jobs will be created during the 10-year installation period. Each year thereafter 2.3 man-years of employment will be needed to operate and maintain the project. Operation and maintenance of the project will have a continuing favorable effect on the local economy.

Additional income will be received by the laborers employed during construction and by farmers from the increased sales of farm products as a result of damage reduction and agricultural enhancement. The increased purchase of items or services required to produce and market the expanded production represents new income to local farm supply dealers, transporters, and processors.

The new income will generate additional consumer expenditures for basic necessities, items which improve their standard of living, and

other goods and services. These expenditures will initiate a chain of spending whereby each successive recipient spends a portion of the amount received. Business activity in other sectors of the local economy and region will increase as this new income is spent and respent. Also, more employment opportunities will be provided in these sectors.

Loss of agricultural production in the sediment pools will result in a loss of income.

Application of land treatment measures will increase opportunities for watershed residents. Land adequately treated will result in increased yields requiring more hired labor to produce and harvest the added production. Increased yeilds result in more income, some of which will be spent at retail outlets. Added expenditures will require added sales personnel.

Employment opportunities will be increased during the treatment of critical areas. For example: the shaping of critical roadbank areas will provide employment for heavy equipment operators. About 650 hours of operator time valued at $3,250, will be required to shape roadbank gullies. In addition, an estimated 2,275 hours of employment, valued at $6,800, will be created by land preparation, vegetation, mulching, fertilization, and shaping of these areas.

Conservation land treatment in conjunction with the structural measure program will reduce flooding. Reduced flooding of roads will enable workers to get to work on time, buses to pick up school children, and mail to be delivered as scheduled.

Reduced flooding will result in increased income for watershed residents by allowing for more efficient use of available land resources. For example, the application of a conservation cropping system increases production by rotating crops in combination with cultural and management measures. This system does not deplete the soil of essential nutrients as does planting the same crop year after year.

The improved economic climate will enable the community to better support new or improved schools, parks, roads, health facilities, and other public projects that will add to the enjoyment of life.

The project will affect the local agricultural economy by increasing income in four ways: (1) reducing the likelihood of having to replant or plant late, (2) reducing crop losses from floods, (3) enabling farmers to produce higher yields and a better quality crop, and (4) improving the conditions for harvesting crops. Soybeans and corn are important crops in the watershed which require planting at the proper time to obtain maximum yields. Ryder concluded that, "soybean

yields can decline nearly 3 bushels per acre for each 10-day delay in planting after the first of May. Corn yields decline more than soybeans when planted after May 15." 12/

Reduced flooding will help increase the per capita income of watershed residents. The latest per capita income (1971) for watershed residents was $2,681. According to past trends, per capita income has been increasing about 6 percent per year. This increase can be expected to be higher except in years when general economic conditions are unfavorable. The project should have minimum effects on supplemental farm enterprises such as recreation and wood products on marginal agricultural land.

Knowledge of the protection afforded by the project will give residents a greater sense of economic security. Families can offer their children greater incentives to continue their education and remain in the community. The family farm pattern of agriculture will be strengthened which will help maintain population stability.

Some social economic adjustments will be required. Two farming operations, one business, and five dwellings will be displaced by project installation. There will be 12 persons displaced from the 5 dwellings. The impact of these adjustments will be minimized with help from the local sponsors. A comparable replacement dwelling giving full consideration to the desires and needs of the family involved should make the adjustments minor and the period of adjustment short.

The scenic and aesthetic well being of the watershed residents will be affected by the application of 7,000 feet or 5 acres of vegetation along field borders. This vegetation will also provide food and shelter for birds and animals in the watershed. This will increase hunting opportunities for local residents which will improve their quality of life.

The project will contribute to the economic goals of the Tennessee Valley Authority and the Appalachian Regional Development Act of 1965. The project will have a favorable impact on the economic growth and rural development in the region.

The Natchez Trace Parkway contains 17.5 miles of scenic highway within the watershed and is reserved for use by the public. The project will not affect this area.

Rural-residential developments are presently being developed adjacent to planned structures sites 20 and 21. Reservoirs created by the floodwater retarding structures will enhance the area at these sites. A

public water supply is available to these developments. These developments were in progress when the proposed structures were planned and all enhanced land values are incidental to the project.

Local secondary benefits will accrue in the watershed and surrounding area as a result of the project. The increase in agricultural production will result in a greater demand for agricultural machinery, equipment, and supplies. The additional income of the landowners will have a multiplier effect in the area. Increased profits by local industries will increase the demand for transportation, processing, and marketing of the increased production.

Application of the planned forest land treatment and management measures will reduce erosion, runoff, and sediment problems. Well-managed forests will enhance recreation, wildlife habitat, timber production values, and water quality.

The forest and wildlife resources will be benefited by a more efficient use of forest management techniques to enhance the value of forest products and availability of wildlife food in the area.

Tree planting on 2,000 acres of unproductive land will be brought back into production and in turn enhance the economy of the watershed area.

The relocations will affect the environment by causing five houses to be moved or raised to new locations. In general, the conditions of the new housing for displaced persons will be comparable or better than the present housing, thereby improving the environment for these displaced persons. The installation of structure 21 will cover with water a 5-acre catfish pond and one rainbow trout raceway. These improvements will be re-established. Installation of site No. 13 will involve moving one hog operation to a new location. This will mean that new land will be covered by the holding pens and feeding barns which will be constructed at a new location.

Open land resulting from project installation of the channel can be used for agricultural purposes if the landowner so desires. This land will be best suited for pasture or wildlife plantings.

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6/ Yokley, Dr. Paul Jr., "Environmental Assessment on Cypress Creek Watershed". (Unpublished research, University of North Alabama, January 15, 1974).

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11/ Climatological Data, United States Department of Commerce, National Oceanic and Atmospheric Administration 1972 Edition Vol. 78, No. 13, (Washington D.C.: Government Printing Office).

12/ Potash Institute of North America, Better Crops with Plant Food, No. 2-1973, pp. 10 and 12.

PROJECT BENEFITS

The estimated average annual monetary damages (table 5) will be reduced from $407,700 to $104,100, or 75 percent. Crop and pasture damages will be reduced from $183,300 to $45,100, or 75 percent. Other agricultural damages, such as loss of livestock, fences, and farm equipment and supplies, etc., will be reduced from $117,100 to $29,100, or 75 percent. Road and bridge damages will be reduced from $48,900 to $12,500, or 74 percent. Flood plain scour damages will be reduced from $19,700 to $9,600, or 52 percent. Indirect damages will be reduced from $38,700 to $7,800, or 80 percent. In addition, the average annual flood damage reduction benefits from land treatment measures are estimated to be $14,200 (table 6).

Benefits from more intensive use of cropland averages $127,100 annually on approximately 7,851 acres. These were calculated on the basis that landowners will make more efficient use of available resources with the project. The project will enable landowners to plant and harvest crops at the proper time. Better quality crops will be produced. Changed land use benefits were calculated to be $77,250 annually.

The installation and operation of structural measures results in redevelopment benefits of $111,100. Employment of local labor during installation and operation contribute to these benefits. An estimated 343 jobs will be created by the installation of the project measures over the 10-year installation period. In addition 2.3 permanent jobs for project Operation and Maintenance will be created.

The average annual benefits resulting from the enhanced land values surrounding the two reservoirs in the residential areas are $44,050. These benefits are incidental and will accrue to a number of beneficiaries.

Secondary benefits averaging $284,400 annually will result from increased income to wholesalers, processors, and suppliers in the immediate trade area. These benefits occur as a result of the increased agricultural production made possible by the project installation. Secondary benefits from the national standpoint were not pertinent to the economic evaluation of this watershed.

COMPARISON OF BENEFITS AND COSTS

The total average annual cost of structural measures (amortized total installation and project administration costs plus annual operation and maintenance costs) is $523,050. These measures are expected to produce average annual primary benefits of $648,650. The benefit-cost ratio, excluding secondary benefits, is 1.3 to 1.0. The ratio of total annual project benefits accruing to structural measures, $933,050, to the average annual cost of structural measures, $523,050, is 1.8 to 1.0 (table 6).

PROJECT INSTALLATION

The non-critical area land treatment measures on private land will be applied within the 10-year installation period by individual farmers in cooperation with the Lauderdale County Soil and Water Conservation District and the Wayne County Soil Conservation District. The Districts will provide technical assistance for the planning and application of the project measures. As available, other financial assistance will be provided to landowners for installing land treatment measures. The Soil Conservation Service and Forest Service, using PL-566 funds, will supplement the technical assistance provided under the going programs. This additional technical assistance will accelerate the rate of planning and application of the land treatment measures. The goal is the completion of the installation of adequate treatment measures on 6,000 additional acres of cropland, 5,700 additional acres of forest land, and 10,050 additional acres of pastureland by the end of the installation period. The district directors of the soil and water conservation districts will assume aggressive leadership in accelerating the land treatment program now being applied.

Land treatment measures on critical areas will be applied within the 10-year installation period by division of work. For gullies and borrow pits, the Soil Conservation Service will be responsible for the necessary shaping and purchase of lime, fertilizer, and seed. Local sponsors share of installation will include seedbed preparation, application of materials, and repair work. For roadbanks, the Soil Conservation Service will contract the vegetative work; the local sponsors will do the necessary shaping. The work to be performed by the Soil Conservation Service does not exceed cost-sharing rates for such practices applicable under other going programs.

The Alabama Forestry Commission and the Tennessee Division of Forestry in cooperation with the U. S. Forest Service, will provide technical assistance in the planning and application of forest land treatment measures. Technical assistance will also be provided to assist the landowners and operators with any special problems generated by urban development in the forested areas. They will provide additional technical assistance for accelerating the installation of the planned land treatment measures. The foresters assigned to this project will be trained in watershed management. They will assist and guide the landowners in the installation of the planned forestry measures. One of the first objectives of the foresters will be the preparation of watershed management plans on the forest lands as a part of the conservation plans.

An accelerated Cooperative Fire Control Program will be used during the installation period. A specially equipped truck with removable pumper equipment is to be purchased to supplement the Alabama program. A fire contactor program will be used in Tennessee. After project installation is complete the program should be strong enough to eliminate the need for more special equipment and accelerated assistance. The fire control program will then be financed fully by the regular Cooperative Forest Fire Control Program.

The installation of land treatment measures which will benefit wildlife will be encouraged at every opportunity. Landowners will be encouraged to seek assistance from the Alabama Department of Conservation and Natural Resources in the management and stocking of their reservoirs and ponds for fish and the management of the water bodies for wildlife.

The Cypress Creek Watershed Conservancy District, organized under Alabama statutes, will acquire all necessary land rights in Alabama. The Lauderdale County Commission will install structural measures in Alabama by contract during the 10-year installation period. The Three Cypress Creek Watershed District, organized under Tennessee statutes, will acquire all necessary land rights and contract for structural measures in Tennessee. All powers granted by the state will be used, if necessary, to achieve project objectives. This includes the power of eminent domain.

As a part of project administration, the Cypress Creek Watershed Conservancy District and Three Cypress Creek Watershed District will provide written notice of displacement and appropriate application forms to each displaced person, business, or farm operation, assist in filing applications, review and approve applications for relocation assistance, review and process grievances in connection with displacements, and make relocation payments. The Soil Conservation Service, as a part of its project administration responsibility, will assist the Cypress Creek Watershed Conservancy District and Three Cypress Creek Watershed District in fulfilling their responsibilities. The Cypress Creek Watershed Conservancy District and Three Cypress Creek Watershed District, as a part of project administration, will provide such relocation assistance advisory services without PL-566 financial assistance as may be needed in connection with the relocation of displaced persons, businesses or farm operations. The advisory services are specified in the USDA Rules and Regulations as printed in the Federal Register May 6, 1971, and corrected September 25, 1971, and include such items as: (1) determination of needs, (2) obtaining current pertinent information concerning housing programs, costs, etc., (3) developing and handing out brochures, (4) assurance of replacement dwellings, and (5) assisting in getting established.

The sponsors have determined that decent, safe, and sanitary replacement housing will be available for all persons subject to displacement by the project. These persons will be given at least a 90-day notice before they have to move.

Technical assistance will be provided by the Soil Conservation Service in the preparation of plans and specifications, construction inspection, preparation of contract payment estimates, final inspection, execution of certificates of completion, and related tasks necessary to install structural measures. The Soil Conservation Service will, as a part of project administration, assist the authority in fulfilling its responsibilities in carrying out the requirements of Public Law 91-646.

The sponsors will develop and maintain a financial amanagement system which will provide for accurate, current, and complete disclosure of the financial results of each PL-566 undertaking in which the Soil Conservation Service has a financial interest in accordance with SCS reporting requirements. The system will provide for effective control over and accountability for all funds, accounting records, and periodic audits by the sponsors. The State Administrative Officer of the SCS must determine that the financial management system meets SCS requirements, as stated in the Administrative Services Handbook, prior to approval of SCS fund obligating agreements.

As required by Public Law 86-523, the Service will keep the Secretary of the Interior informed of the construction schedule so that the Secretary can arrange for the necessary archaeological salvage. Further, if any archaeological materials are found during construction, the Secretary will be similarly notified.

Structure No. 20 will be installed after the installation of Structure Nos. 18 and 19. Designs are based on this sequence.

The sequence of construction will generally be construction of the floodwater retarding structures followed by the channel work. The channel work may, however, be installed when all the structures upstream from the work have been constructed.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement described in this work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666), as amended.

The cost of installing the needed land treatment measures during the 10-year installation period will be borne by the landowners and operators of the land on which these measures are installed. The Farmers Home Administration, local banks, and other lending institutions can arrange financing for the landowners and operators' share of the cost.

The Soil Conservation Service will provide funds in the estimated amount of $200,300 to finance the cost of technical assistance in planning and application of land treatment measures. This consists of $162,400 of Public Law 566 funds and $37,900 to be provided from Public Law 46 funds (table 1). The Forest Service will provide funds in the estimated amount of $33,200 to finance the cost of technical assistance in planning and application of land treatment measures. This consists of $16,000 of Public Law 566 funds and $17,200 of the on-going Cooperative Forestry Program funds.

Funds for the local share of the project installation cost will be provided by the Three Cypress Creek Watershed District, the Cypress Creek Watershed Conservancy District and the Lauderdale County Commission. The Watershed District was organized under Tennessee law and has the authority to assess landowners in the District following approval of a feasibility hearing before the County Court. The Watershed Conservancy District was organized under Alabama law but does not have the authority to raise revenue. Financial assistance, in Alabama, will be provided by the Lauderdale County Commission from general tax revenues. The Alabama sponsors intend to organize a Water Management District which has the authority to raise revenue and the power of eminent domain. When the Water Management District is formed and becomes a legal entity it will take over the watershed responsibilities of the Cypress Creek Watershed Conservancy District and the Lauderdale County Commission.

Financial and other assistance to be furnished by the Soil Conservation Service is contingent on the appropriation of funds for this purpose. In addition, the following prerequisite conditions will be met before federal funds will be made available for the installation of the structural measures:

1. The requirements for land treatment in the drainage areas above the floodwater retarding structures have been met.

2. All necessary land rights have been obtained.

3. County roads affected by floodwater retarding structures No. 9, 11, 13, and 20 have been raised, moved, or closed.

4. Utilities such as power lines, telephone lines, and pipelines have been modified or permission has been granted to inundate the properties involved.

5. Relocation agreements have been executed.

6. Project agreements have been executed.

7. Operation and maintenance agreements have been executed.

8. Plan for handling program income will be developed.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be maintained by the landowners and operators of farms on which the measures are installed under agreements with the Wayne County Soil Conservation District and the Launderdale County Soil and Water Conservation District. Representatives of the districts will encourage landowners to maintain land treatment measures. Land treatment on critical areas will be maintained by the watershed sponsors along the roadbanks. Sponsors will have agreements with landowners or landusers for maintenance of gullies and borrow pits.

The Alabama Forestry Commission and the Tennessee Division of Forestry, in cooperation with the U. S. Forest Service, will furnish technical assistance necessary for operating and maintaining forest land treatment measures. They will do this through the Cooperative Forest Management Program. The Alabama Forestry Commission and the Tennessee Division of Forestry will continue fire protection under the Cooperative Forest Fire Control Program.

The Three Cypress Creek Watershed District will be responsible for the operation and maintenance of those structural measures in Tennessee. Funds for this purpose will be provided by the Watershed District by an assessment against the benefitted land. The estimated average annual cost of operation and maintenance in Tennessee is $4,900 ($4,500 for floodwater retarding structures and $400 for channels).

The Lauderdale County Commission will be responsible for the operation and maintenance of those structural measures in Alabama. Funds for this purpose will be provided from the counties general tax revenue. The estimated average annual cost of operation and maintenance in Alabama is $14,600 ($5,000 for floodwater retarding structures and $9,600 for channels). The estimated average annual costs for operation and maintenance in the watershed is $19,500 ($9,500 structures, $10,000 channels).

The Service and the sponsors will make a joint inspection annually or after unusually severe floods, or in the event of other unusual conditions that may adversely affect the works of improvement, for three years following installation of each structure. Inspection after the third year will be made annually by the sponsors. The Service will participate in annual inspections as often as it elects to do so after the third year. Inspection items are those items which may need maintenance. Items of inspection and maintenance on the structures will include, but will not be limited to, condition of principal spillways, earth fills, emergency spillways, vegetative cover, fences, gates, and vegetative growth in reservoirs. Items of inspection and

maintenance on the channel work will include, but will not be limited to, sand bars, undesirable vegetation, logs, stumps and other debris in the channels.

It is estimated that a 3-year establishment period will be needed for the channels to reach a stable "aged" condition. It is expected that remedial work including spot revegetation, sandbar and debris removal, and riprap for protection of eroding areas of channel banks will be needed during the establishment period. This work will be done by the Service using PL-566 funds.

Immediately following completion of the structures by the contractor, the sponsors will be responsible for and promptly perform, or have performed, without cost to the Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Service. The sponsors will be responsible for maintenance of vegetation associated with structural measures after the initial vegetation work is adequately completed, as determined by the Service, but no later than three years following completion of each structural measures. Maintenance of the floodwater retarding structures will consist of items such as controlling undesirable vegetation by mowing, hand cutting, or using herbicides; painting metal parts; and repairing eroded areas. Maintenance of the channel work will involve mowing, fertilizing, and reseeding of vegetated areas; removing undesirable debris from the channel flow area and; following the initial 3-year vegetative establishment period, repair any damage or change in the vegetation. The mowing operations for the most part will be done with a farm-type tractor and shredder. Use of herbicides will be in accordance with state regulations.

An operation and maintenance agreement will be executed by the parties hereto prior to the signing of the initial project agreement and the issuance of invitations to bid on construction of the structural measures. The agreement will set forth specific details on procedure in line with recognized assignments of responsibility. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with PL-566 financial assistance.

TABLE 1 - FOR ALABAMA PORTION OF WATERSHED
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
LAND TREATMENT									
Cropland 2/	Ac.	5,000				179,800		179,800	179,800
Pastureland 2/	Ac.	8,250				486,000		486,000	486,000
Forest land 2/	Ac.	3,600					93,200	93,200	93,200
Wildlife land 2/	Ac.	150				8,250		8,250	8,250
Individual Practices									
Fire Control Equipment				2,000	2,000		2,000	2,000	4,000
Coop. Fire Control							35,500	35,500	35,500
Critical Area Treatment									
Roadside Stabilization	Ac.	2.2	2,100		2,100	2,400		2,400	4,500
Crit. Gullies & Borrow	Ac.	22.0	8,500		8,500	2,900		2,900	11,400
Technical Assistance			82,400	10,000	92,400	12,600	10,800	23,400	115,800
TOTAL LAND TREATMENT	XXX	XXX	93,000	12,000	105,000	691,950	141,500	833,450	938,450
STRUCTURAL MEASURES									
Construction									
Floodwater Retarding Structures	No.	10	2,591,850		2,591,850				2,591,850
Channel Work 4/									
(N)	Mi.	12,70	790,100		790,100				790,100
(M)	Mi.	.70	39,950		39,950				39,950
(O)	Mi.	.64	41,150		41,150				41,150
Subtotal - Construction			3,463,050		3,463,050				3,463,050

TABLE 1 - FOR ALABAMA PORTION OF WATERSHED (Cont.)
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
Engineering Services			282,000		282,000				282,000
Relocation Payments			13,400		13,400	3,100		3,100	16,500
Project Administration									
Construction Inspection			364,250		364,250				364,250
Other			225,800		225,800	5,100		5,100	230,900
Relocation Assistance Advisory Services						700		700	700
Subtotal - Administration			590,050		590,050	5,800		5,800	595,850
Other Costs									
Land Rights						521,450		521,450	521,450
Subtotal - Other						521,450		521,450	521,450
TOTAL STRUCTURAL MEASURES			4,348,500		4,348,500	530,350		530,350	4,878,850
TOTAL PROJECT			4,441,500	12,000	4,453,500	1,222,300	141,500	1,363,800	5,817,300

1/ Price base - 1975.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed and dollar amounts apply to total land areas not just adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel before project: (N)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel; (O)-none or practically no defined channel.

TABLE 1 - FOR TENNESSEE PORTION OF WATERSHED
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
LAND TREATMENT									
Cropland 2/		1,000				36,000		36,000	36,000
Pastureland 2/		1,800				109,500		109,500	109,500
Forest land 2/		2,100					54,700	54,700	54,700
Wildlife land 2/		20				1,150		1,150	1,150
Individual Practices									
Coop. Fire Control				46,200	46,200		51,200	51,200	97,400
Critical Area Treatment									
Roadside Stabilization	Ac.	7.8	8,400		8,400	9,600		9,600	18,000
Crit. Gullies & Borrow	Ac.	28.0	12,100		12,100	3,700		3,700	15,800
Technical Assistance			80,000	6,000	86,000	25,300	6,400	31,700	117,700
TOTAL LAND TREATMENT	XX	XXX	100,500	52,200	152,700	185,250	112,300	297,550	450,250
STRUCTURAL MEASURES									
Construction									
Floodwater Retarding Structures	No.	9	2,517,300		2,517,300				2,517,300
Channel Work 4/									
(N)	Mi.	.23	23,050		23,050				23,050
(M)	Mi.	.15	15,400		15,400				15,400
Subtotal - Construction			2,555,750		2,555,750				2,555,750

TABLE 1 - FOR TENNESSEE PORTION OF WATERSHED (Cont.)
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
Engineering Services			168,500		168,500				168,500
Relocation Payments			5,400		5,400	1,300		1,300	6,700
Project Administration									
Construction Inspection			264,550		264,550				264,550
Other			159,900		159,900	2,700		2,700	162,600
Relocation Assistance Advisory Services						300		300	300
Subtotal - Administration			424,450		424,450	3,000		3,000	427,450
Other Costs									
Land Rights						162,350		162,350	162,350
Subtotal - Other						162,350		162,350	162,350
TOTAL STRUCTURAL MEASURES			3,154,100		3,154,100	166,650		166,650	3,320,750
TOTAL PROJECT			3,254,600	52,200	3,306,800	351,900	112,300	464,200	3,771,000

1/ Price base - 1975.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed and dollar amounts apply to total land areas, not just to adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel before project: (n)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel.

TABLE 1 - FOR TOTAL WATERSHED
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
LAND TREATMENT									
Cropland 2/	Ac.	6,000				215,800		215,800	215,800
Pastureland 2/	Ac.	10,050				595,500		595,500	595,500
Forest land 2/	Ac.	5,700					147,900	147,900	147,900
Wildlife land 2/	Ac.	170				9,400		9,400	9,400
Individual Practices									
Fire Control Equipment				2,000	2,000		2,000	2,000	4,000
Coop. Fire Control				46,200	46,200		86,700	86,700	132,900
Critical Area Treatment									
Roadside Stabilization	Ac.	10	10,500		10,500	12,000		12,000	22,500
Crit. Gullies & Borrow	Ac.	50	20,600		20,600	6,600		6,600	27,200
Technical Assistance			162,400	16,000	178,400	37,900	17,200	55,100	233,500
TOTAL LAND TREATMENT	XXX	XXX	193,500	64,200	257,700	877,200	253,800	1,131,000	1,388,700
STRUCTURAL MEASURES									
Construction									
Floodwater Retarding Structures	No.	19	5,109,150		5,109,150				5,109,150
Channel Work 4/									
(N)	Mi.	12.93	813,150		813,150				813,150
(M)	Mi.	.85	55,350		55,350				55,350
(O)	Mi.	.62	41,150		41,150				41,150
Subtotal - Construction			6,018,800		6,018,800				6,018,800

TABLE 1 - FOR TOTAL WATERSHED (Cont.)
ESTIMATED PROJECT INSTALLATION COST
Cypress Creek Watershed

INSTALLATION COST ITEM	UNIT	NUMBER NON-FED. LAND	ESTIMATED COST (Dollars) 1/ PL-566 FUNDS NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	OTHER NON-FEDERAL LAND SCS 3/	FS 3/	TOTAL	TOTAL
Engineering Services			450,500		450,500				450,500
Relocation Payments			18,800		18,800	4,400		4,400	23,200
Project Administration									
Construction Inspection			628,800		628,800				628,800
Other			385,700		385,700	7,800		7,800	393,500
Relocation Assistance Advisory Services						1,000		1,000	1,000
Subtotal - Administration			1,014,500		1,014,500	8,800		8,800	1,023,300
Other Costs									
Land Rights						683,800		683,800	683,800
Subtotal - Other						683,800		683,800	683,800
TOTAL STRUCTURAL MEASURES			7,502,600		7,502,600	697,000		697,000	8,199,600
TOTAL PROJECT			7,696,100	64,200	7,760,300	1,574,200	253,800	1,828,000	9,588,300

1/ Price base - 1975.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed and dollar amounts apply to total land areas not just to adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel before project: (N)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel; (O)-none or practically no defined channel.

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of Work Plan preparation)

CYPRESS CREEK WATERSHED

MEASURES	UNIT	APPLIED TO DATE	TOTAL COST (Dollars) 1/
LAND TREATMENT			
Conservation Cropping System	Ac.	699	22,368
Field Border	Ft.	2,400	72
Ponds	No.	98	73,500
Grassed Waterways	Ac.	54	9,180
Pasture & Hayland Planting	Ac.	2,664	173,160
Terracing	Ft.	2,650	159
Wildlife Habitat Management	Ac.	73	4,015
Drainage Field Ditches	Ft.	2,400	528
Drainage Mains & Laterals	Ft.	2,650	1,457
Pasture & Hayland Management	Ac.	5,877	11,754
Tree Planting	Ac.	76	1,520
Contour Farming	Ac.	180	540
Crop Residue Management	Ac.	403	1,612
TOTAL	:::	:::::	299,865

1/ Price base 1975.

January 1976

TABLE 2 - ALABAMA PORTION OF WATERSHED
ESTIMATED STRUCTURAL COST DISTRIBUTION
Cypress Creek Watershed
(Dollars) 1/

ITEM	INSTALLATION COST - PL-566				INSTALLATION COST-OTHER FUNDS			TOTAL INSTALLATION COST
	CONSTRU-TION	ENGI-NEERING	RELOC. PAYMENTS	TOTAL PL-566	LAND RIGHTS	RELOC. PAYMENTS	TOTAL OTHER	
Floodwater Retarding Structures (FRS)								
No. 8	145,900	14,600		160,500	14,000		14,000	174,500
No. 9	192,550	15,400	2,850	210,800	43,900	650	44,550	255,350
No. 11	315,700	18,950		334,650	21,650		21,650	356,300
No. 12	181,750	18,200		199,950	11,000		11,000	210,950
No. 13	234,900	18,800	3,250	256,950	89,300	750	90,050	347,000
No. 15	252,500	20,200		272,700	30,250		30,250	302,950
No. 16	194,850	15,600	1,600	212,050	23,750	400	24,150	236,200
No. 17	113,200	11,300		124,500	8,450		8,450	132,950
No. 20	738,250	44,300	2,450	785,000	130,800	550	131,350	916,350
No. 21	222,250	17,800	3,250	243,300	39,050	750	39,800	283,100
TOTAL FRS	2,591,850	195,150	13,400	2,800,400	412,150	3,100	415,250	3,215,650
Channel Work								
Cypress Main								
430+00-476+00(N)2/(BLR)3/	72,850	8,750		81,600	7,250		7,250	88,850
537+00-652+00(N)2/(BLR)3/	190,650	15,250		205,900	18,150		18,150	224,050
691+00-828+00(N)2/(BLR)3/	222,300	17,800		240,100	21,600		21,600	261,700
828+00-919+00(N)2/(C&S)3/	52,050	6,250		58,300	23,000		23,000	81,300
Middle Cypress								
447+00-563+00(N)2/(C&S)3/	110,150	11,000		121,150	13,200		13,200	134,350
682+00-738+00(N)2/(C&S)3/	72,000	8,650		80,650	6,350		6,350	87,000
738+00-828+00(N)2/(C&S)3/	48,900	5,850		54,750	10,200		10,200	64,950

January 1976

TABLE 2 - ALABAMA PORTION OF WATERSHED (cont.)
ESTIMATED STRUCTURAL COST DISTRIBUTION
Cypress Creek Watershed
(Dollars) 1/

ITEM	INSTALLATION COST - PL-566 FUNDS				INSTALLATION COST-OTHER FUNDS			TOTAL INSTALLATION COST
	CON$TRU-TION	ENGI-NEERING	RELOC. PAYMENTS	TOTAL PL-566	LAND RIGHTS	RELOC. PAYMENTS	TOTAL OTHER	
Little Cypress								
992+00-1010+00(M)2/(C&S)3/	17,350	2,250		19,600	2,300		2,300	21,900
1010+00-1032+00(N)2/(C&S)3/	21,200	2,750		23,950	2,750		2,750	26,700
Dulin Branch								
418+00-437+00(M)2/(BLR)3/	22,600	2,950		25,550	1,800		1,800	27,350
Threet Creek								
623+00-641+00(O)2/(NCE)3/	26,250	3,400		29,650	1,450		1,450	31,100
North Fork Creek								
541+00-557+00(O)2/(NCE)3/	14,900	1,950		16,850	1,250		1,250	18,100
Total Channel	871,200	86,850		958,050	109,300		109,300	1,067,350
Subtotal	3,463,050	282,000	13,400	3,758,450	521,400	3,100	524,550	4,283,000
Project Administration	XXX	XXX	XXX	590,050	XXX	XXX	5,800	595,850
TOTAL				4,348,500			530,300	4,878,850

1/ Price base 1975
2/ Type of channel before project: (N)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel; (O)-none or practically no defined channel.
3/ Type of channel work: (BLR)-bedload removal; (C&S)-clearing and shaping; (NCE)-new channel excavation.

January 1976

TABLE 2 - TENNESSEE PORTION OF WATERSHED
ESTIMATED STRUCTURAL COST DISTRIBUTION
Cypress Creek Watershed
(Dollars) 1/

ITEM	INSTALLATION COST - PL-566 FUNDS				INSTALLATION COST-OTHER FUNDS			TOTAL INSTALLATION COST
	CONSTRU-TION	ENGI-NEERING	RELOC. PAYMENTS	TOTAL PL-566	LAND RIGHTS	RELOC. PAYMENTS	TOTAL OTHER	
Floodwater Retarding Structures (FRS)								
No. 1	167,550	13,400		180,950	13,850		13,850	194,800
No. 2	143,100	14,300	400	157,800	8,600	100	8,700	166,500
No. 3	360,100	21,600	2,100	383,800	12,750	500	13,250	397,050
No. 5	169,400	13,550		182,950	7,900		7,900	190,850
No. 6	303,850	18,250	2,900	325,000	23,650	700	24,350	349,350
No. 7	289,900	17,400		307,300	1,650		1,650	308,950
No. 10	454,750	27,300		482,050	37,700		37,700	519,750
No. 18	341,100	20,450		361,550	28,600		28,600	390,150
No. 19	287,550	17,250		304,800	26,300		26,300	331,100
Total FRS	2,517,300	163,500	5,400	2,686,200	161,000	1,300	162,300	2,848,500
Channel Work								
Cypress Main								
410+00-418+00(M)2/(BLR)3/	15,400	2,000		17,400	550		550	17,950
418+00-430+00(N)2/(BLR)3/	23,050	3,000		26,050	800		800	26,850
Total Channel	38,450	5,000		43,450	1,350		1,350	44,800
Subtotal	2,555,750	168,500	5,400	2,729,650	162,350	1,300	163,650	2,893,300
Project Administration	XXX	XXX	XXX	424,450	XXX	XXX	3,000	427,450
TOTAL				3,154,100			166,650	3,320,750

1/ Price base 1975
2/ Type of channel before project: (N)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel; (O)-none or practically no defined channel.
3/ Type of channel work: (BLR)-bedload removal; (C&S)-clearing and shaping; (NCE)-new channel excavation.

January 1976

TABLE 2 - FOR TOTAL WATERSHED

ESTIMATED STRUCTURAL COST DISTRIBUTION

Cypress Creek Watershed

(Dollars) 1/

ITEM	INSTALLATION COST - PL-566 FUNDS				INSTALLATION COST-OTHER FUNDS			TOTAL
	CONSTRU-TION	ENGI-NEERING	RELOC. PAYMENTS	TOTAL PL-566	LAND RIGHTS	RELOC. PAYMENTS	TOTAL OTHER	INSTALLATION COST
Floodwater Retarding Structures (FRS)								
No. 1	167,550	13,400		180,950	13,850		13,850	194,800
No. 2	143,100	14,300	400	157,800	8,600	100	8,700	166,500
No. 3	360,100	21,600	2,100	383,800	12,750	500	13,250	397,050
No. 5	169,400	13,550		182,950	7,900		7,900	190,850
No. 6	303,850	18,250	2,900	325,000	23,650	700	24,350	349,350
No. 7	289,900	17,400		307,300	1,650		1,650	308,950
No. 8	145,900	14,600		160,500	14,000		14,000	174,500
No. 9	192,550	15,400	2,850	210,800	43,900	650	44,550	255,350
No. 10	454,750	27,300		482,050	37,700		37,700	519,750
No. 11	315,700	18,950		334,650	21,650		21,650	356,300
No. 12	181,750	18,200		199,950	11,000		11,000	210,950
No. 13	234,900	18,800	3,250	256,950	89,300	750	90,050	347,000
No. 15	252,500	20,200		272,700	30,250		30,250	302,950
No. 16	194,850	15,600	1,600	212,050	23,750	400	24,150	236,200
No. 17	113,200	11,300		124,500	8,450		8,450	132,950
No. 18	341,100	20,450		361,550	28,600		28,600	380,150
No. 19	287,550	17,250		304,800	26,300		26,300	331,100
No. 20	738,250	44,300	2,450	785,000	130,800	550	131,350	916,350
No. 21	222,250	17,800	3,250	243,300	39,050	750	39,800	283,100
Total FRS	5,109,150	358,650	18,800	5,486,600	573,150	4,400	577,550	6,064,150

January 1976

TABLE 2 - FOR TOTAL WATERSHED (cont.)
ESTIMATED STRUCTURAL COST DISTRIBUTION
Cypress Creek Watershed
(Dollars) 1/

ITEM	INSTALLATION COST - PL-566 FUNDS				INSTALLATION COST-OTHER FUNDS			TOTAL INSTALLATION COST
	CONSTRU-TION	ENGI-NEERING	RELOC. PAYMENTS	TOTAL PL-566	LAND RIGHTS	RELOC. PAYMENTS	TOTAL OTHER	
Channel Work								
Cypress Main								
410+00-418+00(M)2/(BLR)3/	15,400	2,000		17,400	550		550	17,950
418+00-430+00(N)2/(BLR)3/	23,050	3,000		26,050	800		800	26,850
430+00-476+00(N)2/(BLR)3/	72,850	8,750		81,600	7,250		7,250	88,850
537+00-652+00(N)2/(BLR)3/	190,650	15,250		205,900	18,150		18,150	224,050
691+00-828+00(N)2/(BLR)3/	222,300	17,800		240,100	21,600		21,600	261,700
828+00-919+00(N)2/(C&S)3/	52,050	6,250		58,300	23,000		23,000	81,300
Middle Cypress								
447+00-563+00(N)2/(C&S)3/	110,150	11,000		121,150	13,200		13,200	134,350
682+00-738+00(N)2/(C&S)3/	72,000	8,650		80,650	6,350		6,350	87,000
738+00-828+00(N)2/(C&S)3/	48,900	5,850		54,750	10,200		10,200	64,950
Little Cypress								
992+00-1010+00(M)2/(C&S)3/	17,350	2,250		19,600	2,300		2,300	21,900
1010+00-1032+00(N)2/(C&S)3/	21,200	2,750		23,950	2,750		2,750	26,700
Dulin Branch								
418+00-437+00(M)2/(BLR)3/	22,600	2,950		25,550	1,800		1,800	27,350
Threet Creek								
623+00-641+00(O)2/(NCE)3/	26,250	3,400		29,650	1,450		1,450	31,100
North Fork Creek								
541+00-557+00(O)2/(NCE)3/	14,900	1,950		16,850	1,250		1,250	18,100
Total Channel	909,650	91,850		1,001,500	110,650		110,650	1,112,150
Subtotal	6,018,800	450,500	18,800	6,488,100	683,800	4,400	688,200	7,176,300
Project Administration	XXX	XXX	XXX	1,014,500	XXX	XXX	8,800	1,023,300
TOTAL				7,502,600			697,000	8,199,600

1/ Price base 1975
2/ Type of channel before project: (N)-an unmodified, well defined natural channel or stream; (M)-manmade ditch or previously modified channel; (O)-none or practically no defined channel.
3/ Type of channel work: (BLR)-bedload removal; (C&S)-clearing and shaping; (NCE)-new channel excavation.

January 1976

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
Cypress Creek Watershed, Alabama & Tennessee

ITEM	UNIT	FRS STRUCTURE NO.			
		1	2	3	5
lass of Structure		b	b	b	b
rainage Area	Sq. Mi.	1.73	1.16	3.34	1.50
Controlled	Sq. Mi.	---	---	---	---
Curve No. (1-day (AMC II½)		81	81	80	80
Tc	Hrs.	1.07	1.21	1.81	1.18
levation Top of Dam	Ft.	930.4	892.0	812.9	802.1
levation Crest Emergency Spillway	Ft.	925.7	887.0	806.8	797.1
levation Crest High Stage Inlet	Ft.	921.2	881.7	800.0	790.8
levation Crest Low Stage Inlet	Ft.	909.2	866.1	783.1	774.7
aximum Height of Dam	Ft.	37	41	47.9	40.6
olume of Fill	Cu. Yds.	95250	76082	259243	105527
otal Capacity	Ac. Ft.	630	403	1137	501
Sediment Submerged 1st 50 years	Ac. Ft.	53	37	86	41
Sediment Submerged 2nd 50 years	Ac. Ft.	53	37	85	40
Sediment Aerated	Ac. Ft.	18	13	29	14
Retarding	Ac. Ft.	506	316	937	406
Between High and Low Stage	Ac. Ft.	259	174	485	217
urface Area					
Sediment Pool	Acres	14	7	17	8
Retarding Pool	Acres	59	29	75	36
rincipal Spillway					
Rainfall Volume (areal)(1-day)	In.	6.9	6.9	6.90	6.90
Rainfall Volume (areal)(10-day)	In.	12.6	12.6	12.60	12.60
Runoff Volume (10-day)	In.	8.01	8.01	7.85	7.85
Capacity of Low Stage (Max.)	cfs	28	19	54	24
Capacity of High Stage (Max.)	cfs	66	69	122	70
Frequency Operation-Emergency Spillway	% chance	2	2	2	2
Size of Conduit	Dia. (in.)	24	24	30	24
ergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.3	8.3	8.3	8.3
Runoff Volume (ESH)	In.	6.02	6.02	5.91	5.91
Type		Veg.	Veg.	Veg.	Veg.
Bottom Width	Ft.	100	75	125	100
Velocity of Flow (Ve)	Ft./Sec.	5.2	5.5	5.8	5.6
Slope of Exit Channel	Ft./Ft.	0.035	0.035	0.033	0.034
Maximum Water Surface Elevation	Ft.	927.18	888.62	808.55	798.68
reeboard					
Rainfall Volume (FH)(areal)	In.	16.5	16.5	16.5	16.5
Runoff Volume (FH)	In.	13.97	13.97	13.85	13.85
Velocity of Flow (Ve)	Ft./Sec.	10.5	10.9	11.8	10.8
Maximum Water Surface Elevation	Ft.	930.37	891.97	812.91	802.09
apacity Equivalents					
Sediment Volume	In.	1.34	1.41	1.12	1.16
Retarding Volume	In.	5.48	5.10	5.26	5.08

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
Cypress Creek Watershed, Alabama & Tennessee

ITEM	UNIT	FRS STRUCTURE NO.			
		6	7	8	9
Class of Structure		b	b	b	b
Drainage Area	Sq. Mi.	5.17	3.44	1.84	5.98
Controlled	Sq. Mi.	---	---	---	---
Curve No. (1-day (AMC II½)		80	80	81	79
Tc	Hrs.	2.14	2.28	1.65	2.44
Elevation Top of Dam	Ft.	734.1	729.4	675.6	719.7
Elevation Crest Emergency Spillway	Ft.	728.8	724.6	672.1	713.5
Elevation Crest High Stage Inlet	Ft.	721.5	717.4	668.4	---
Elevation Crest Low Stage Inlet	Ft.	702.1	701.2	657.1	696.6
Maximum Height of Dam	Ft.	48.1	42.4	32	43
Volume of Fill	Cu. Yds.	179117	173821	81329	190600
Total Capacity	Ac. Ft.	1674	1188	642	1870
Sediment Submerged 1st 50 years	Ac. Ft.	100	89	56	137
Sediment Submerged 2nd 50 years	Ac. Ft.	100	88	56	273 1/
Sediment Aerated	Ac. Ft.	34	30	19	47
Retarding	Ac. Ft.	1440	981	511	1550
Between High and Low Stage	Ac. Ft.	750	499	276	---
Surface Area					
Sediment Pool	Acres	21	19	15	48
Retarding Pool	Acres	112	79	64	144
Principal Spillway					
Rainfall Volume (areal)(1-day)	In.	6.90	6.9	6.9	6.9
Rainfall Volume (areal)(10-day)	In.	12.60	12.6	12.6	12.6
Runoff Volume (10-day)	In.	7.85	7.85	8.01	7.70
Capacity of Low Stage (Max.)	cfs	84	55	30	113
Capacity of High Stage (Max.)	cfs	184	116	104	---
Frequency Operation-Emergency Spillway	% chance	2	2	2	2
Size of Conduit	Dia. (in.)	36	30	30	30
Emergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.3	8.3	8.3	8.3
Runoff Volume (ESH)	In.	5.91	5.91	6.02	5.78
Type		Veg.	Veg.	Veg.	Veg.
Bottom Width	Ft.	250	200	200	200
Velocity of Flow (Ve)	Ft./Sec.	5.7	5.2	4.6	6.2
Slope of Exit Channel	Ft./Ft.	0.034	0.036	0.038	0.031
Maximum Water Surface Elevation	Ft.	730.41	726.07	673.33	715.3
Freeboard					
Rainfall Volume (FH)(areal)	In.	16.5	16.5	16.5	16.5
Runoff Volume (FH)	In.	13.85	13.85	13.97	13.69
Velocity of Flow (Ve)	Ft./Sec.	10.9	10.6	8.8	11.8
Maximum Water Surface Elevation	Ft.	734.05	729.44	675.64	719.7
Capacity Equivalents					
Sediment Volume	In.	0.85	1.13	1.31	1.01
Retarding Volume	In.	5.22	5.34	5.20	4.85

1/ 100-year sediment submerged

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
Cypress Creek Watershed, Alabama & Tennessee

ITEM	UNIT	FRS STRUCTURE NO.			
		10	11	12	13
lass of Structure		b	a	b	b
rainage Area	Sq. Mi.	8.92	5.75	2.60	7.20
Controlled	Sq. Mi.	---	---	---	---
Curve No. (1-day (AMC II½)		83	80	79	83
Tc	Hrs.	3.2	3.65	1.93	2.98
levation Top of Dam	Ft.	768.6	678.8	655.1	620.9
levation Crest Emergency Spillway	Ft.	762.3	674.2	651.0	616.2
levation Crest High Stage Inlet	Ft.	754.6	666.6	646.1	---
levation Crest Low Stage Inlet	Ft.	736.1	649.0	632.8	600.4
aximum Height of Dam	Ft.	43	41	36.5	37
olume of Fill	Cu. Yds.	300862	219713	115300	147724
otal Capacity	Ac. Ft.	3167	1858	876	2685
Sediment Submerged 1st 50 years	Ac. Ft.	164	102	77	256
Sediment Submerged 2nd 50 years	Ac. Ft.	163	101	76	256
Sediment Aerated	Ac. Ft.	56	35	26	88
Retarding	Ac. Ft.	2784	1620	697	2085
Between High and Low Stage	Ac. Ft.	1427	834	365	---
rface Area					
Sediment Pool	Acres	40	24	17	60
Retarding Pool	Acres	204	115	57	243
rincipal Spillway					
Rainfall Volume (areal)(1-day)	In.	6.9	6.9	6.9	6.9
Rainfall Volume (areal)(10-day)	In.	12.6	12.6	12.6	12.6
Runoff Volume (10-day)	In.	8.46	7.85	7.70	8.46
Capacity of Low Stage (Max.)	cfs	148	96	42	154
Capacity of High Stage (Max.)	cfs	256	181	112	---
Frequency Operation-Emergency Spillway	% chance	2	2	2	2
Size of Conduit	Dia. (in.)	42	36	30	36
ergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.3	8.3	8.3	8.3
Runoff Volume (ESH)	In.	6.26	5.91	5.78	6.26
Type		Veg.	Veg.	Veg.	Veg.
Bottom Width	Ft.	250	300	200	300
Velocity of Flow (Ve)	Ft./Sec.	5.7	4.9	4.9	4.5
Slope of Exit Channel	Ft./Ft.	0.032	0.037	0.037	0.040
Maximum Water Surface Elevation	Ft.	764.04	675.50	652.26	617.33
reeboard					
Rainfall Volume (FH)(areal)	In.	16.5	16.5	16.5	16.5
Runoff Volume (FH)	In.	14.27	13.85	13.69	14.27
Velocity of Flow (Ve)	Ft./Sec.	12.3	10.4	9.7	10.5
Maximum Water Surface Elevation	Ft.	768.59	678.81	655.05	620.9
apacity Equivalents					
Sediment Volume	In.	0.80	0.77	1.29	1.56
Retarding Volume	In.	5.85	5.28	5.03	5.43

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
Cypress Creek Watershed, Alabama & Tennessee

ITEM	UNIT	FRS STRUCTURE NO. 15	16	17	18
lass of Structure		a	a	a	b
rainage Area	Sq. Mi.	4.36	2.65	1.43	6.61
Controlled	Sq. Mi.	---	---	---	---
Curve No. (1-day (AMC II½)		82	84	81	77 1/
Tc	Hrs.	2.64	1.66	1.29	3.23
levation Top of Dam	Ft.	702.9	708.3	671.3	816.9
levation Crest Emergency Spillway	Ft.	698.8	704.9	667.2	812.0
levation Crest High Stage Inlet	Ft.	693.6	700.8	663.3	---
levation Crest Low Stage Inlet	Ft.	680.2	688.7	653.7	790.4
aximum Height of Dam	Ft.	35	34.3	26.6	44.0
olume of Fill	Cu. Yds.	153596	119900	53767	202395
otal Capacity	Ac. Ft.	1565	1065	504	2400
Sediment Submerged 1st 50 years	Ac. Ft.	107	113	40	180
Sediment Submerged 2nd 50 years	Ac. Ft.	107	112	40	176
Sediment Aerated	Ac. Ft.	37	38	14	60
Retarding	Ac. Ft.	1314	802	410	1984
Between High and Low Stage	Ac. Ft.	675	437	214	---
urface Area					
Sediment Pool	Acres	26	25	13	39
Retarding Pool	Acres	141	100	50	171
rincipal Spillway					
Rainfall Volume (areal)(1-day)	In.	6.9	6.9	6.9	6.9
Rainfall Volume (areal)(10-day)	In.	12.6	12.6	12.6	12.6
Runoff Volume (10-day)	In.	8.46	8.75	8.01	8.46
Capacity of Low Stage (Max.)	cfs	69	51	23	176
Capacity of High Stage (Max.)	cfs	165	114	61	---
Frequency Operation-Emergency Spillway	% chance	2	2	2	3/
Size of Conduit	Dia. (in.)	36	30	24	36
ergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.3	8.3	8.3	8.3
Runoff Volume (ESH)	In.	6.14	6.39	6.02	5.55
Type		Veg.	Veg.	Veg.	Veg.
Bottom Width	Ft.	300	300	100	300
Velocity of Flow (Ve)	Ft./Sec.	4.7	4.3	4.8	---2/
Slope of Exit Channel	Ft./Ft.	0.039	0.040	0.037	0.036
Maximum Water Surface Elevation	Ft.	700.01	706.01	668.49	811.4
reeboard					
Rainfall Volume (FH)(areal)	In.	16.5	16.5	16.5	18.0
Runoff Volume (FH)	In.	14.12	14.12	13.97	14.85
Velocity of Flow (Ve)	Ft./Sec.	9.7	8.7	9.4	10.74
Maximum Water Surface Elevation	Ft.	702.86	708.33	671.25	816.9
apacity Equivalents					
Sediment Volume	In.	1.08	1.86	1.23	1.18
Retarding Volume	In.	5.65	5.68	5.37	5.63

1/ Based on AMC II
2/ No emergency spillway flow
3/ Frequency of Operation - Less than once in 50 years.

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURES
Cypress Creek Watershed, Alabama & Tennessee

ITEM	UNIT	FRS STRUCTURE NO. 19	20	21	TOTAL
ass of Structure		b	b	b	
ainage Area	Sq. Mi.	5.69	19.03	4.65	93.05
Controlled	Sq. Mi.	---	12.30	---	
Curve No. (1-day (AMC II½)		75 1/	75 1/	79	
Tc	Hrs.	3.12	7.17	2.88	
levation Top of Dam	Ft.	697.2	604.8	598.4	
levation Crest Emergency Spillway	Ft.	693.0	601.0	592.3	
levation Crest High Stage Inlet	Ft.	---	586.5	---	
levation Crest Low Stage Inlet	Ft.	670.3	566.6	570.7	
ximum Height of Dam	Ft.	42	61	49	
lume of Fill	Cu. Yds.	180560	263640	148338	3048299
tal Capacity	Ac. Ft.	2200	11400	1574	37316
Sediment Submerged 1st 50 years	Ac. Ft.	136	477	221	2472
Sediment Submerged 2nd 50 years	Ac. Ft.	136	467	220	2449
Sediment Aerated	Ac. Ft.	46	162	75	841
Retarding	Ac. Ft.	1882	10294	1058	31554
Between High and Low Stage	Ac. Ft.	---	2943	---	9555
rface Area					
Sediment Pool	Acres	30	67	31	521
Retarding Pool	Acres	164	710	100	2646
incipal Spillway					
Rainfall Volume (areal)(1-day)	In.	6.9	6.9	6.9	
Rainfall Volume (areal)(10-day)	In.	12.6	12.6	12.6	
Runoff Volume (10-day)	In.	6.79	6.79	7.70	
Capacity of Low Stage (Max.)	cfs	116	634	120	
Capacity of High Stage (Max.)	cfs	---	2120	---	
Frequency Operation-Emergency Spillway	% chance	4/	1	2	
Size of Conduit	Dia. (in.)	30	60 3/	30	
ergency Spillway					
Rainfall Volume (ESH)(areal)	In.	8.3	8.3	8.3	
Runoff Volume (ESH)	In.	5.31	5.22	5.78	
Type		Veg.	Veg.	Veg.	
Bottom Width	Ft.	350	800	150	
Velocity of Flow (Ve)	Ft./Sec.	---2/	--- 2/	6.2	
Slope of Exit Channel	Ft./Ft.	.036	.030	.032	
Maximum Water Surface Elevation	Ft.	691.0	590.3	594.13	
eeboard					
Rainfall Volume (FH)(areal)	In.	18.0	18.0	16.5	
Runoff Volume (FH)	In.	14.53	14.53	13.69	
Velocity of Flow (Ve)	Ft./Sec.	9.5	7.91	12.1	
Maximum Water Surface Elevation	Ft.	697.2	604.8	598.4	
pacity Equivalents					
Sediment Volume	In.	1.05	1.09	2.06	
Retarding Volume	In.	6.20	10.15	4.27	

1/ Based on AMC II
2/ No emergency spillway flow
3/ 2-5'x6' monolithic bax culverts for high stage riser
4/ Frequency of operation - less than once in 50 years

TABLE 3A - STRUCTURE DATA
CHANNELS
Cypress Creek Watershed
Alabama & Tennessee

Channel Design-nation	Reach Station Ft.	Reach Station Ft.	Drainage Area Sq. Mi. 1/	Capacity Req'd (cfs)	Capacity Design (cfs)	Hydraulic Gradient (ft./ft.)	Channel Dimensions Bottom (ft.)	Depth (ft.)	Side 2/ Slopes	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation (cu. yds.)	Planned Type of Work 3/	Before Project Type of Channel 4/	Before Project Flow 5/ Conditions	Material Classification Bank 6/	Material Classification Bed	Wetted Perimeter (ft.)	Minimum Cross-Sectional Area (ft.²)
Cypress Creek Main	410+00	437+00	11.10	185	300	0.0042		3.5	F	0.045	0.040	3.70	4.16	---	BLR	N	Pr	GW	GW	28	70
	437+00	476+00	12.20	340	425	0.0038		4.2	F	0.045	0.040	3.59	3.92	---	BLR	N	Pr	GW	GW	33	100
	537+00	560+00	14.13	515	729	0.0038		4.0	F	0.045	0.040	4.68	5.2.	---	BLR	N	Pr	GW	GW	60	265
	560+00	642+00	16.64	515	680	0.0033		4.0	F	0.045	0.040	4.38	4.90	---	BLR	N	Pr	GW	GW	45	160
	642+00	652+00	19.70	515	680	0.0032		4.0	F	0.045	0.040	4.38	4.80	---	BLR	N	Pr	GW	GW	45	160
	691+00	828+00	25.32	550	583	0.0036		4.0	F	0.045	0.040	4.05	4.53	---	BLR	N	Pr	GP	GW	45	160
	829+00	919+00	45.21	1100	1080	0.0023	40	5.8	F	0.040	0.038	4.07	4.26	---	C&S	N	Pr	GP	GW	65	270
Dulin Branch	418+00	437+00	0.53	60	70	0.0060		2.5	F	0.045	0.040	3.80	4.26	---	BLR	M (1954)	Pr	GW-GM	GW	22	60
North Fork	541+00	557+00	0.29	110	180	0.0040	8	3.0	3:1	0.040	0.025	3.59	5.74	3560	NCE	N	Pr	GW	GW	--	--
Threet Creek 7/	623+00	641+00	3.44	135	163	0.0032	8	3.0	3:1	0.040	0.025	3.21	5.10	4400	NCE	N	Pr	SC-SM	GW	--	--
Middle Cypress Creek	447+00	563+00	5.50	275	309	0.0036			F	0.045	0.040	3.94	4.41	---	C&S	N	Pr	GM	GW	30	80
	682+00	738+00	10.61	350	371	0.0030			F	0.040	0.038	3.75	3.95	---	C&S	N	Pr	GW	GW	38	100
	738+00	828+00	14.22	550	650	0.0025			F	0.040	0.038	4.56	4.79	---	C&S	N	Pr	GW	GW	45	160
Little Cypress Creek	902+00	1032+00	7.86	790	785	0.0012			F	0.045	0.040	3.29	3.70	---	C&S	N	Pr	GW-GM	GW	59	240

1/ Drainage area shown is uncontrolled drainage area or that not controlled by floodwater retarding structures.
2/ F indicates reaches in which channel work performed will be done so as to conform to the existing channel banks.
3/ BLR (Bedload Removal), C&S (Clearing and Shaping), NCE (New Channel Excavation).
4/ N (An Unmodified, Well-Defined Natural Channel or Stream), M ( ) - Man-made Ditch or Previously Modified Channel with Approximate Date of Construction in Parentheses.
5/ Pr (Perennial - Flows at All Times Except During Extreme Drought).
6/ GW (Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines), GP (Poorly Graded Gravels or Gravel-Sand Mixtures, Little or No Fines), SP (Poorly Graded Sands or Gravelly Sands, Little or No Fines), GM (Silty Gravels, Gravel-Sand Mixture), GW-GM (Well Graded Gravel with 7-12 Percent Fines), SC-SM (Either a Clayey Sand (SC) or a Silty Sand (SM).
7/ Drop structure located at Station 637+00, see table 3B.

TABLE 3B - STRUCTURE DATA

GRADE STABILIZATION STRUCTURE

Cypress Creek Watershed, Alabama and Tennessee

Station	Drainage Area	Design Cap.	Assoc. Frequency and Duration of Storm	Drop	Concrete	Type of Structure
	(sq.mi.)	(cfs)		(ft.)	(cu.yds.)	
Sta. 637+00 Threet Cr.	3.44 1/	160	0.6 yr. 24 hr.	3.5	38.0	Reinforced Concrete Drop Spillway

1/ Uncontrolled drainage area. Floodwater retarding structure 9 controls runoff from 5.98 square miles.

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TABLE 4 - ANNUAL COST

Cypress Creek Watershed, Alabama and Tennessee

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
FRS 1,2,3,5,6, 7,8,9,19,11, 12,13,15,16, 17,18,19,20, 21, and channel work	440,700	19,500	460,200
Project Administration	62,850		62,850
GRAND TOTAL	503,550	19,500	523,050

1/ Price base 1975
2/ 100-years at 6 1/8 percent.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Cypress Creek Watershed, Alabama and Tennessee

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	183,300	45,100	138,200
Other Agricultural	117,100	29,100	88,000
Nonagricultural			
Road & Bridge	48,900	12,500	36,400
Subtotal	349,300	86,700	262,600
Erosion			
Flood Plain Scour	19,700	9,600	10,100
Indirect	38,700	7,800	30,900
TOTAL	407,700	104,100	303,600

1/ Price base: crop and pasture damages current normalized prices (October 1974), other damages 1975 prices.

January 1976

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Cypress Creek Watershed, Alabama and Tennessee

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/							Average Annual Cost 2/	Benefit-Cost Ratio
	Damage Reduction	More Intensive Land Use	Changed Land Use	Land Use and Development	Redevelopment	Secondary	Total		
FRS 1,2,3,5,6,7,8, 9,10,11,12,13,15,16, 17,18,19,20,21, and channel work	289,150 3/	127,100	77,250	44,050	111,100	284,400	933,050	460,200	2.0:1.0
Project Administration								62,850	
GRAND TOTAL	289,150	127,100	77,250	44,050	111,100	284,400	933,050	523,050	1.8:1.0

1/ Price base: crop and pasture benefits current normalized prices (October 1974), other benefits 1975 prices.
2/ From Table 4
3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $14,200 annually.

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INVESTIGATIONS AND ANALYSES

Land Use and Treatment

The status of land treatment measures for the watershed was developed by supervisors of Lauderdale County, Alabama, and Wayne County, Tennessee, with the assistance of Soil Conservation Service personnel headquartered in Florence, Alabama; Waynesboro, Tennessee; and Auburn, Alabama. The analysis was made by studying (1) representative soil and water conservation plans, (2) long-range soil conservation district programs for Lauderdale County, Alabama, and Wayne County, Tennessee, and (3) conservation needs inventories for the two counties. Conservation problems were studied both in the office and on the land. The findings were expanded for the entire watershed.

This analysis provided pertinent data on total conservation needs, accomplishments to date, and remaining needs. This information was used in establishing priorities for soil survey, conservation planning, application, and maintenance of needed land treatment measures.

The funds for accelerated technical assistance represent the difference in amount of funds now being expended and those which will be required to meet the land treatment goal by the end of the 10-year installation period.

Sedimentation Investigations

Sedimentation investigations were made as follows:

1. The 100-year sediment storage requirements for all floodwater retarding structures were made according to procedures outlined in Technical Release No. 12 (Revised), Sediment Storage Requirements for Reservoirs, USDA, SCS, January 1968. The following field and office studies were made:

    a. Erosion rates for the watershed were developed from a 6 percent sampling of the uplands. Sampled data on soil, slope, cover, and treatment conditions were tabulated and summarized within topographically similar soils areas. The Musgrave soil loss equation was used to arrive at estimated gross sheet erosion rates within each of these areas. Streambank, roadside, and gully erosion rates were calculated from data obtained in field and aerial photograph study.

b. The estimated gross erosion occurring within the drainage area of each structure was adjusted to reflect the estimated delivery ratio and the trap efficiency of each reservoir. Sediment delivery ratios determined from sediment surveys of existing reservoirs were used to estimate the sediment. 1/ The trap efficiency was to be 90 percent for the medium and Fine-grained sediment.

c. Allowances for differences in density of aerated and submerged sediment are based on an average weight of 87 pounds per cubic foot for completely aerated sediment to 60 pounds per cubic foot for submerged sediment.

d. Allocation of sediment in the structure pools for 100 years is as follows:

POOLS	CONDITION	PERCENT BY VOLUME
Sediment	Submerged	85.5
Detention	Aerated	14.5

2. Sediment and erosion damage investigations on the flood plain were made by the valley cross section sampling method.

   All sources of material causing or contributing to the sediment damages on the flood plain and their damage potential were weighted to establish the relative importance of each of these sources. This information served as a guide in evaluating the effects of the project on damage reduction.

3. The sediment load carried out of the watershed was estimated by applying a delivery ratio of 24 percent to the gross erosion under existing conditions and with applied additional land treatment. A delivery ratio of 25 percent was used to estimate the sediment load which will be carried out of the watershed under "with project" conditions from the uncontrolled watershed area after installation of the floodwater retarding structures.

Geologic Investigations

Preliminary geologic damsite investigations were made at each of the floodwater retarding structure sites. These investigations included studies of valley slopes, alluvium, and exposed geologic formations. Foundation conditions are similar throughout the watershed. Geologic formations are deeply weathered and depth to bedrock varies from 50 to 100 feet. All foundations and abutments are composed of deep, unconsolidated materials composed of firm, gravelly silts and clays. 2/

The location of all sites in relation to geologic unit(s) is as follows:

Stratigraphic Location of Floodwater Retarding Structures*

Upper Cretaceous	Upper Cretaceous and Mississippian	Mississippian	
Tuscaloosa Group (Kt)	Tuscaloosa Group (Kt) & Tuscumbia Limestone (Mt)	Tuscumbia Limestone (Mt)	Tuscumbia Limestone (Mt) & Fort Payne Chert (Mfp)
1	3	10	11
2	5	18	12
7	6	19	13
8			20
9			21
15			
16			
17			

The structure of the watershed is simple; the watershed lies on the southwest flank of the Nashville dome. Regional dip of the rock is toward the southwest at 30 to 45 feet per mile. Subsurface mapping of the top of the Chattanooga Shale indicates several gentle anticlines, synclines, and other structures in the vicinity of the watershed 2/ but none (such as faulting) that would profoundly affect the location or function of structural measures.

Detailed investigations, including exploration with core drilling equipment, will be made at each floodwater retarding structure site prior to construction to determine the suitability and methods of handling foundation and embankment materials.

Economic Investigations

Basic methods used in economic investigations and analyses are outlined in the Economics Guide for Watershed Protection and Flood Prevention, U. S. Department of Agriculture, Soil Conservation Service, March 1964.

Because of the diversity of damageable values and flood plain characteristics, the flood plain was divided into 26 reaches. Agricultural and nonagricultural damages occur in all the reaches.

* See figure 5.

All damages were calculated by using the frequency method. Owners and operators of flood plain lands were interviewed to obtain information relative to past, present, and future land use; crop distribution under normal conditions; planting dates, harvesting dates, and yields; and historical data on flooding and resultant damages to crops and pastures, as well as to other agricultural property. The land use of the entire flood plain was obtained by field mapping.

Crop and pasture damages were determined by applying damage rates by depth and season to the acres inundated by selected frequency storms to obtain an average annual damage for each reach. This computed damage was discounted for recurrent flooding with allowance for partial recovery of crops between floods.

Other agricultural damages to fences and farm roads, livestock losses, and the cost of removing debris from fields were estimated from information collected in the field and correlated with area and depth of flooding.

Road and bridge damages were based on information obtained from county commissioners and state highway department officials, supplemented by information gathered from local residents.

The monetary value of the physical damage from overbank deposition and flood plain scouring was based on the loss in productivity for various degrees of damage as determined by field sedimentation and scouring studies.

Indirect damages were estimated to amount to 10 percent of direct damages in all categories except for road and bridge damages which were estimated at 20 percent of direct damages.

More intensive land use benefits were determined by calculating the value of composite acres with and without project. The unadjusted benefits were determined by multiplying the difference times the acres in the reach that benefits were being claimed. The benefits were not discounted because information indicates farmers will intensify as soon as the project is installed.

Benefits from restoration to former productivity and changed land use were evaluated on the basis of increases in net income from the reduction of flood hazards. Associated costs and increased damages to higher values were deducted. To avoid double counting, restoration to former productivity and changed land use benefits were evaluated together; and the benefits were divided based on interviews with landowners, agricultural workers, and field observation. Benefits were claimed on 602 acres.

Benefits from the enhanced land value surrounding Sites Nos. 20 and 21 were determined by deducting the present land value and development costs from the value of the land with the reservoirs completed. These developments were underway before this plan was begun. The benefits are incidental and will accrue to a number of beneficiaries.

Redevelopment benefits resulting from installation of project measures are based on utilization of unemployed local labor. The amount of construction cost spent for local labor was estimated to be about 30 percent based on interviews and available performance records from other watersheds. Thirty percent of the construction costs was converted to an annual equivalent by amortization at 6 1/8 percent interest over a 100-year period. Redevelopment benefits resulting from employment in operation and maintenance of structural measures were estimated by taking 50 percent of the operation and maintenance cost and dividing by 25 years to obtain the rate of decline. This was multiplied by the present value of a decreasing annuity to obtain the present capital value. The present capital value was amortized at 6 1/8 percent for 100 years to obtain average annual benefits.

Secondary benefits were determined by multiplying primary benefits (excluding indirect land use and development and redevelopment benefits) by a multiplier of 1.82. The multiplier was determined from a study made by the Agricultural Economics Department of Auburn University, Auburn, Alabama. Information for the Multiplier is contained in Agricultural Experiment Station Bulletin 429 "The Structure of the Alabama Economy: An Input-Output Analysis" dated February 1972. An average of the state type I and type II output multiplier was used.

Values of land needed for structural measures were compared with values of comparable land in the watershed. Estimates were based on current market values. The loss of net income in the pool areas of the flood-water retarding structures was found to be less than the amortized value of land rights; therefore, there is no other economic cost applicable to the project.

Engineering Investigations

The procedures used to develop the most feasible plan of structural measures to meet the objectives of the sponsoring local organizations that could not be accomplished by land treatment measures were as follows:

1. Possible sites for structural measures that would accomplish project objectives were found by use of topographic maps and aerial photo-

graphs, supplemented with field investigations. Preliminary studies were made to determine the physical feasibility and involvement of land and improvements and to provide data for laying out field surveys.

2. Surveys--Engineering surveys were made after preliminary agreement was reached with the sponsoring local organizations on the sites to be studied for potential structural measures. Property lines and ownership of the land involved were furnished by the sponsors.

   a. Vertical control--Existing U. S. Geological Survey and U. S. Coast and Geodetic Survey bench marks were supplemented with temporary bench marks set at strategic locations for use in making surveys.

   b. Floodwater retarding structures--Field surveys were made in two stages. First, topographic maps of possible sites were prepared. Roads, utility lines, and miscellaneous improvements located within the reservoir areas were surveyed. Second, after preliminary designs and layouts of the floodwater retarding structures that would be feasible to install were reviewed and accepted by the sponsors, more detailed topographic survey of the damsites and reservoir areas were made. These topographic maps were Kelsh plotted from low-level flight photography and used for proportioning the floodwater retarding structures. A profile survey of the centerline of each damsite was made. These surveys provided the data necessary to determine the most economical and feasible design, to make estimates of the installation cost, and to prepare the land rights work maps. Procedures outlined in current Soil Conservation Service watersheds memoranda were used in making all surveys.

3. Designs--Design of structural measures was a continuous process during work plan development. Designs were made of individual or related groups of structures as information was collected and surveys were completed. Classification for limiting design criteria of the potential sites for floodwater retarding structures was made considering the damages that might result from a sudden breach of the earth embankment. Sites Nos. 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 18, 19, 20, and 21 were given a "b" classification. The remaining structure sites were given an "a" classification because damages would be limited to agricultural lands and county roads in the event of a structural failure. All of the structures were given the approximate classification as set forth in Soil Conservation Service Washington Engineering Memorandum 27 (Revised).

Hydrologic design of the floodwater retarding structures equals or exceeds the criteria specified in Engineering Memorandum 27 (Revised) and Alabama Engineering Memorandum AL-6. Procedures outlined in Chapter 17 and 21, National Engineering Handbook, Section 4, Hydrology, USDA, SCS, August 24, 1972, were used to determine floodwater retarding capacity requirements and hydrograph development.

The cost of Class "A" structures 11, 15, 16, and 17 exceeds $110,000. Hydrologic criteria used for planning was increased because of the cost and to approximate the requirements of the Tennessee Valley Authority.

For each structure various principal spillway types and sizes were computer routed and final designs selected after analyzing the output data. These routings set the minimum emergency spillway crest elevation. Consideration was given to single and two-stage risers, different pipe sizes, maximum release versus needed downstream channel work, structure cost, safety of the structure and the level of protection desired.

A detailed study was made to determine the most feasible and economical means to evacuate the floodwater retarding pools. The basic objective was to evacuate the pools as soon as possible without the principal spillway discharges causing adverse impacts downstream. Two principal spillway flow conditions were considered. One was full pipe flow from the principal spillways. The second was modifying principal spillway discharges by use of two stage inlets with the higher stage above the sediment pool elevation. Low stage inlets will restrict discharges at specific sites and allow full pipe flow at the remaining sites to be the most feasible and economical combination for evacuating the retarding pools.

After the appropriate principal spillway for each site was selected, the emergency spillway and freeboard hydrographs were computer routed using various emergency spillway bottom widths. These routings determined the emergency spillway dimensions and the top of dam elevation. Excavated volumes for the various spillway dimensions were determined.

The emergency spillway for Site 20 was designed to meet the requirements presented in Technical Release No. 52, A Guide for Design and Layout of Earth Emergency Spillways as Part of Emergency Spillway Systems for Earth Dams, USDA, SCS, February 1973. The drainage area for this site exceeds 10 square miles. The topography at Site 20 is such that the emergency spillway located on both abutments will have sufficient longitudinal bulk to meet the requirements.

4. Construction costs for the structural measures were based on current unit prices being expended at similar sites, experience, and values furnished by local organizations and utility companies.

   Annual operation and maintenance costs were estimated considering such costs as fertilization, reestablishment and maintenance of vegetation, weed control, and frequency of use of the emergency spillways. Prices for 1973 adjusted to current normalized prices were used.

Hydraulic and Hydrologic Investigations

Field studies made in the watershed were used to arrive at locations for bridge, valley, and channel cross sections. The location of these sections were determined using aerial photographs, topographic sheets, and onsite studies. Field surveys were used to obtain the information needed to plot these cross sections and a profile of the channels including existing depth and gradient.

Using the valley cross sections, a computer program (Water Surface Profile Program) was run to obtain the capacity of the channels in the watershed. This program required the input of Manning's "n" values. The "n" values were selected for each cross section in accordance with Chapter 5, Section 16, of the Soil Conservation Service, National Engineering Handbook. The water surface profile program provided stage-discharge, end area, and acres of flood plain inundated for 45 valley cross sections. Stage-discharge relationships were developed for an additional 86 channel cross sections using Manning's formula.

To analyze the effects of channel work as well as the floodwater retarding structures to be installed, the Technical Release 20, Project Formulation Computer program was used. Seven different rainfalls were flood routed consisting of the 100-year, 25-year, 10-year, 2-year, 1-year 0.5 year, and 0.2 year frequency 24-hour duration storms. These rainfalls were selected from the U. S. Weather Bureau publication "Rainfall Frequency Atlas of the United States, Technical Paper 40".

This program required input of several values. A rainfall runoff curve number of 72 was used to reflect the land treatment work to be done. This curve number was determined for the watershed considering soil type, land use, and vegetative cover. Another value required was the time of concentration (Tc). The Tc's for each routing reach was determined in accordance with Chapter 15, Section 4, of the Soil Conservation Service National Engineering Handbook. Using the above inputs the TR-20 program was run resulting in elevations of flooding for the seven storms run at

each cross section. These data were checked using stream gage data. The stream gage data was developed into a flow frequency curve through use of the Log Pearson Type III Frequency Method. This data curve was compared to the TR-20 computer output to check the TR-20 program against the gage data from the watershed.

Channel Investigations

Using the without project channel capacities, locations for needed channel work were determined. These work locations are those in which the existing channel will not carry maximum low stage floodwater retarding structure releases plus 5.6 csm from the uncontrolled drainage area. Field reconnaissance was made of the watershed with concentrated studies of the areas not having the required channel capacities. After reviewing the notes from the field study and running several computer alternates, the following types of channel work were found to provide the needed capacities: (1) bedload removal (6.3 miles) will restore depths that existed before channel aggradation, (2) clearing and shaping (7.5 miles) will remove restrictions and reduce channel roughness, and (3) new channel excavation will realign the lower reaches of Threet Creek and North Fork eliminating about 2 miles of existing channels that would require work.

Streambed and bank materials were observed throughout the watershed and sampled at representative locations. Twenty bed material samples and sixteen bank samples were analyzed and classified according to the Unified Soil Classification System. The bedload materials were found to be coarse-grained and non-plastic. Bank materials were found to be medium to coarse-grained with low plasticity.

Procedures outlined in SCS Technical Release-25 were used to plan and design all channel work. The maximum allowable non-scouring velocities and tractive forces were calaculated for the channel designs.

The channels were analyzed at bank full flow under conditions expected after the channel has aged and the vegetation is established. The analysis indicated that the channel will be stable in the aged condition and maximum allowable velocities will not be exceeded.

Archaeological and Historic Investigations

A survey of the prehistoric and historic archaeological resources was carried out by the University of Alabama, Department of Anthropology under funding by the Soil Conservation Service.

A total of 59 sites of archaeological and historical importance were located during the course of the Cypress Creek survey. The majority of the sites, 28 in all, were situated on Cypress Creek and its tributaries. Of the remaining 31 sites, 14 were found on Middle Cypress Creek and its tributaries and 17 were identified on Little Cypress Creek and its tributaries. Ten sites are located within areas subject to disturbance by installation of structural measures.

Six of the ten sites are located within the areas to be flooded following the construction of the floodwater retarding structures. Some of these sites will be constantly submerged, while others will be inundated only during flood periods.

The Alabama Historical Commission was contacted to determine whether there are any sites or structures of historical significance with the watershed which would be affected by the project. The Alabama Historical Commission reviewed all their historic and architectural inventory and made an onsite inspection. They concluded that the construction of the Cypress Creek Watershed project would not have any adverse affect on any historical sites and/or structures. The State Historic Preservation Officer concurred in the conclusions of the commission.

The Tennessee Historical Commission, whose Executive Director is the State Historic Preservation Officer, reviewed the proposed project and does not have any objections.

Fish and Wildlife Resource Investigations

Environmental assessments on the Cypress Creek Watershed were made by Dr. Boschung of the University of Alabama and Dr. Yokley of the University of North Alabama. Inventories of the fauna and flora indigenous to the watershed were concentrated on Cypress Creek and its tributaries. Emphasis was placed on the aquatic environment, including streambank vegetation in those areas to be disturbed by the proposed project. These studies yielded an exhaustive account of the occurrence, distribution, relative abundance and ecology of the fishes in the drainage area. Particular attention was given to rare and endangered fish. Both assessments made predictions on the impact of the project on the fauna and flora of Cypress Creek based on quantitative data collected during this study and other available data.

REFERENCES CITED

1/ "Guide to Sedimentation Investigations", Engineering and Watershed Planning Unit, Technical Guide No. 12. Fort Worth, Texas, Revised, July 1968.

2/ Harris, H. B., R. R. Peace, Jr., and W. F. Harris, Jr., Geology and Ground Water Resources of Lauderdale County, Alabama, Geologic Survey of Alabama County Report 8. University, Alabama 1963.

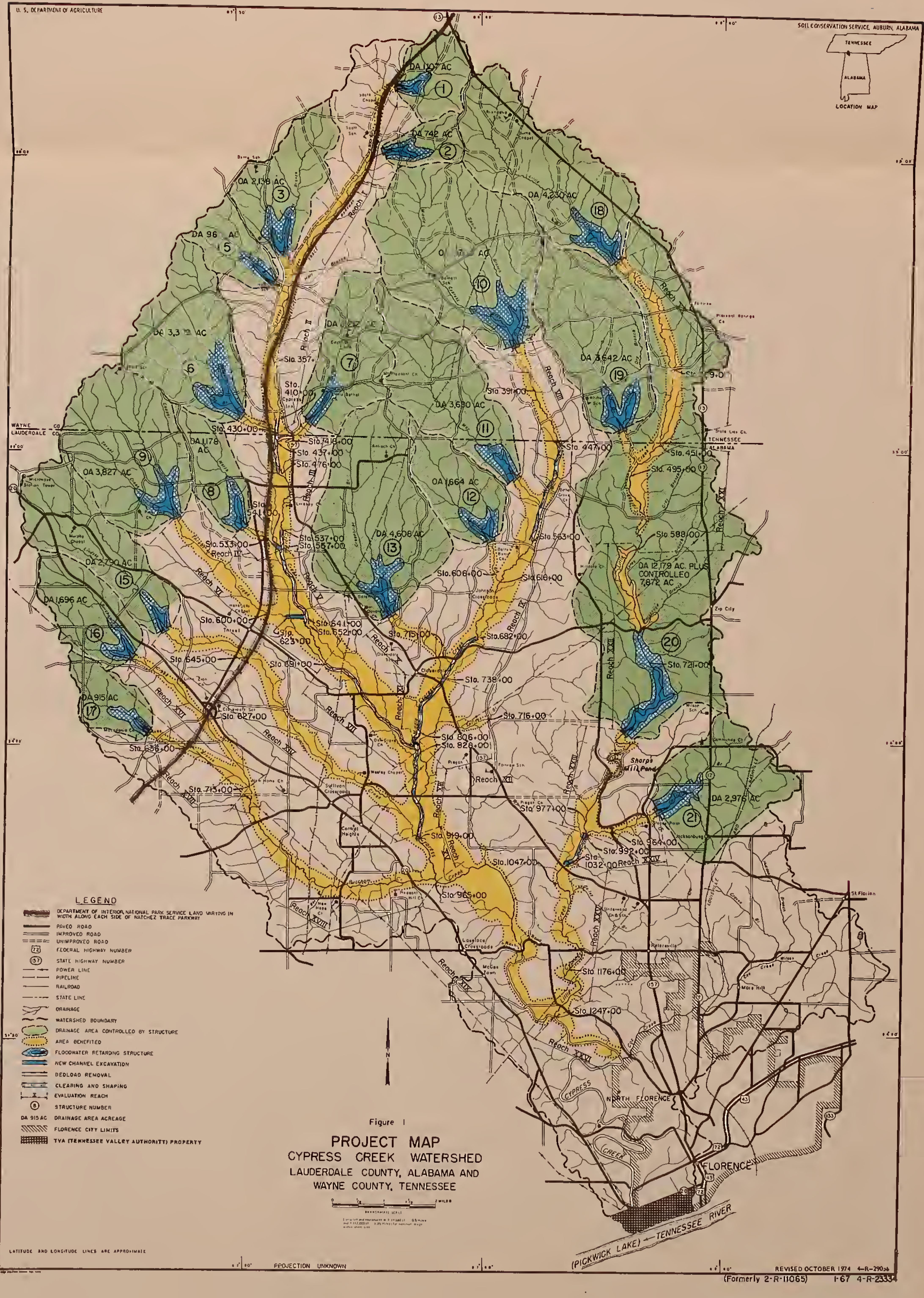


Figure 1

PROJECT MAP
CYPRESS CREEK WATERSHED
LAUDERDALE COUNTY, ALABAMA AND
WAYNE COUNTY, TENNESSEE

U. S. OEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, AUBURN, ALABAMA

LEGEND

- PAVED ROAD
- IMPROVED ROAD
- UNIMPROVED ROAD
- (72) FEDERAL HIGHWAY NUMBER
- (57) STATE HIGHWAY NUMBER
- POWER LINE
- PIPE LINE
- DRAINAGE
- WATERSHED BOUNDARY

LEGEND

1. OICKSON-BODINE-SAFFELL association
2. OICKSON association
3. BOOINE-OEWEY-DICKSON-FULLERTON association
4. DEWEY-OECATUR-OICKSON association
5. LOBELVILLE-LEE-ETOWAH PRUITTON association
6. CHOCCOLOCCO-CHENNEBY-STASER association

N

Figure 2

SOIL ASSOCIATION MAP

CYPRESS CREEK WATERSHED

PORTIONS OF

LAUOERDALE COUNTY, ALABAMA

WAYNE COUNTY, TENNESEE

0 2 4

Approximate Scale - Miles

Albers Equal Area Projection compiled and reproduced at 1:115,200 or 1 inch equals 1.80 Miles.

Base compiled from USGS Quadrangle sheets.

LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

April 1974 4-R-33824-A

(Formerly 2-R-1106S) 1-67 4-R-23334

USOA-SCS-FORT WORTH, TEX. 1974

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, AUBURN, ALABAMA

Figure 3

LAND USE MAP
CYPRESS CREEK WATERSHED
PORTIONS OF
LAUDERDALE COUNTY, ALABAMA
WAYNE COUNTY, TENNESSEE

Albers Equal Area Projection compiled at 1:57,600 or (1 inch equals .9 Miles) and reproduced at 1:115,200 (1 inch equals 1.8 Miles).

Base compiled from USGS Quadrangle sheets.

LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

April 1974 4-R-33,836

(Formerly 2-R-11065) 1-67 4-R-23334

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, AUBURN, ALABAMA

LEGEND

- PAVED ROAD
- IMPROVED ROAD
- UNIMPROVED ROAD
- (72) FEDERAL HIGHWAY NUMBER
- (157) STATE HIGHWAY NUMBER
- POWER LINE
- PIPE LINE
- DRAINAGE
- WATERSHED BOUNDARY

LEGEND

Tabulation of Critically Eroding Areas, Cypress Creek Watershed

LOCATION NO.	TYPE OF AREA	1000'S SQ. FT.
1	Roadbank	8.0
2	Roadbank	6.0
3	Roadbank	8.0
4	Roadbank	10.0
5	Roadbank	4.0
6	Roadbank	7.5
7	Roadbank	15.0
8	Roadbank	7.5
9	Roadbank	4.0
10	Roadbank	6.0
11	Roadbank	5.0
12	Gullies & Borrow Pits	261.4
13	Gullies & Borrow Pits	217.8
14	Gullies & Borrow Pits	4.5
15	Gullies & Borrow Pits	87.1
16	Gullies & Borrow Pits	12.0
17	Gullies & Borrow Pits	7.5
18	Gullies & Borrow Pits	435.6
19	Roadbank	30.0
20	Roadbank	30.0
21	Roadbank	6.0
22	Roadbank	4.0
23	Roadbank	6.0
24	Roadbank	10.0
25	Gullies & Borrow Pits	87.1
26	Roadbank	11.0
27	Gullies & Borrow Pits	87.1
28	Roadbank	4.5
29	Gullies & Borrow Pits	87.1
30	Roadbank	50.0
31	Gullies & Borrow Pits	348.5
32	Gullies & Borrow Pits	87.1
33	Gullies & Borrow Pits	261.4
34	Gullies & Borrow Pits	87.1
35	Roadbank	4.5
36	Roadbank	9.0
37	Roadbank	15.0
38	Gullies & Borrow Pits	130.7
39	Roadbank	6.0
40	Roadbank	15.0
41	Roadbank	6.0
42	Roadbank	4.5
43	Roadbank	4.5
44	Roadbank	9.0
45	Roadbank	9.0
46	Roadbank	6.0
47	Roadbank	6.0
48	Roadbank	6.0
49	Roadbank	6.0
50	Roadbank	6.0
51	Roadbank	6.0
52	Roadbank	12.0
53	Roadbank	7.5
54	Roadbank	12.0
55	Roadbank	15.0
56	Roadbank	5.0
57	Roadbank	9.0
	Total	60 Acres

N

Figure 4

CRITICALLY ERODING AREAS

CYPRESS CREEK WATERSHED

PORTIONS OF

LAUDERDALE COUNTY, ALABAMA

WAYNE COUNTY, TENNESSEE

0 2 4

Approximate Scale - Miles

Albers Equal Area Projection compiled and reproduced at 1:115,200 or 1 inch equals 1.80 Miles.

Base compiled from USGS Quadrangle sheets.

LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

April 1974 4—R—33821

(Formerly 2-R-11065) 1-67 4-R-23334

USDA-SCS-FORT WORTH, TEX. 1974

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, AUBURN, ALABAMA

EXPLANATION

Ke	Eutaw Formation. Fine to medium sand with beds of sandy clay. Rolling, hilly topography.	Cretaceous
Kt	Tuscaloosa Group. Sands, clays, and gravel beds. Rolling, hilly topography.	Cretaceous
Mt	Tuscumbia Limestone. Gray, medium bedded, hard, cherty limestone. Rolling topography with deep gravelly soils.	Mississipplan
Mfp	Fort Payne chert. Light gray, thin to medium-bedded, dense, hard, cherty limestone. Rolling to hilly topography with deep gravelly soils.	Mississipplan

Geology Modified From: Geological Survey of Alabama County Report 8, University of Alabama, 1963 and U. S. Geological Survey Water-Supply Paper 677, Washington, 1936.

Figure 5

GEOLOGIC MAP

CYPRESS CREEK WATERSHED

PORTIONS OF

LAUDERDALE COUNTY, ALABAMA

WAYNE COUNTY, TENNESEE

N

0 2 4

Approximate Scale - Miles

Albers Equal Area Projection compiled and reproduced at 1:115,200 or 1 inch equals 1.80 Miles.

Base compiled from USGS Quadrangle sheets.

LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

USDA-SCS-FORT WORTH, TEX 1974

April 1974

(Formerly 2-R-11065)

4—R—33823

1-67 4-R-23334

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, AUBURN, ALABAMA

LEGEND

1. Areas underlain by thick sections of sands, gravels, and clays (Coastal Plains). The yield, depth and static head are variable. Yields range from 40 to 500 GPM. Depth ranges from 200 to 500 feet. Water is generally of good quality.

2. Areas underlain by cherty regolith and/or less than 100 feet of sands, gravels and clays (Highland Rim). Springs are numerous and have estimated flows of 25 to 200 GPM. Yields water to shallow wells mostly less than 10 GPM. Water is of good quality, locally high in chloride.

3. Areas underlain by limestone of Fort Payne and Tuscumbia formations (Highland Rim). Most productive aquifer in the watershed. Water occurs in openings enlarged by solution along joints and bedding planes. Most water bearing openings are within 200 feet of land surface with the largest usually within 100 feet. Potential yields as high as 2,300 GPM in Cox Creek Valley. Water is of good quality but slightly hard.

Modified From: Ground-water of Alabama (map), 1955 and U. S. Geological Survey Water Supply Paper 677. Washington, 1936.

Figure 8

GROUND WATER AVAILABILITY MAP

CYPRESS CREEK WATERSHED

PORTIONS OF

LAUDERDALE COUNTY, ALABAMA

WAYNE COUNTY, TENNESEE

N

0 2 4

Approximate Scale - Miles

Albers Equal Area Projection compiled and reproduced at 1:115,200 or 1 inch equals 1.80 Miles

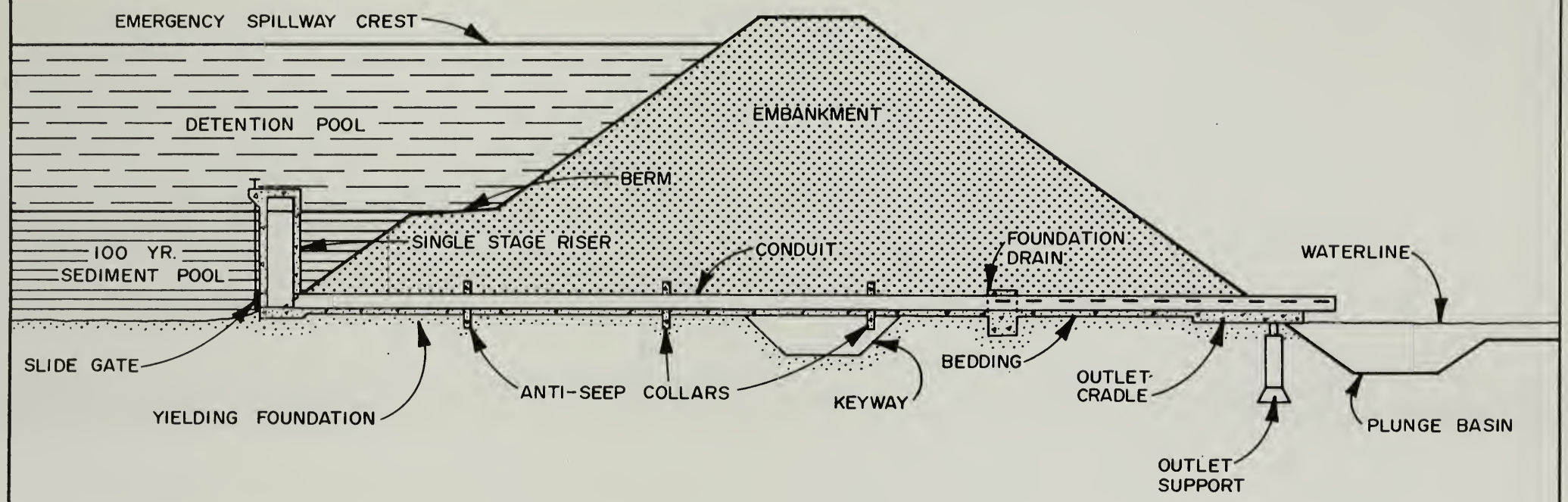
Base compiled from USGS Quadrangle sheets.

LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

April 1974 4-R-33822

(Formerly 2-R-11065) 1-67 4-R-23334

USDA-SCS-FORT WORTH, TEX. 1974

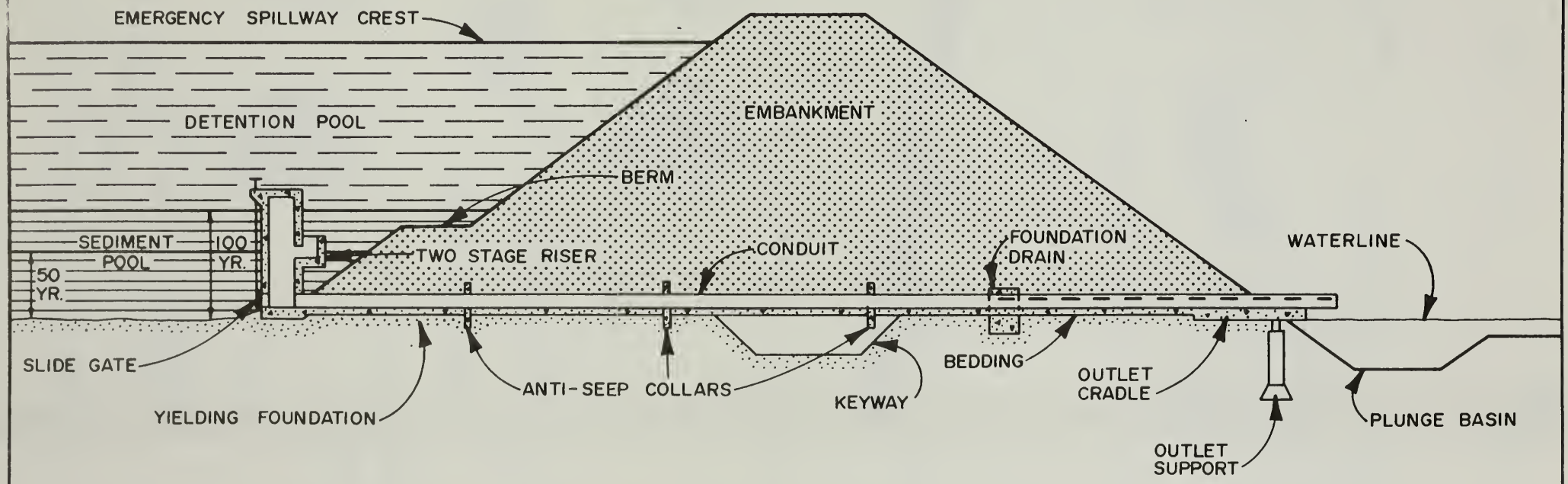


SECTION OF A TYPICAL

FLOODWATER RETARDING STRUCTURE

(Single Stage Riser)

FIGURE 7



SECTION OF A TYPICAL

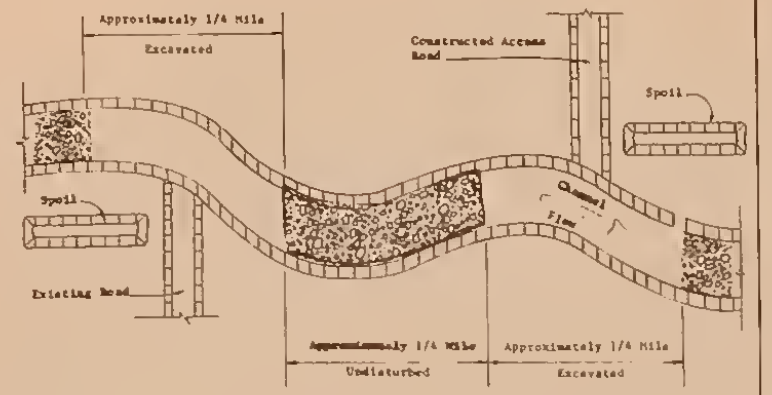
FLOODWATER RETARDING STRUCTURE

(Two Stage Riser)

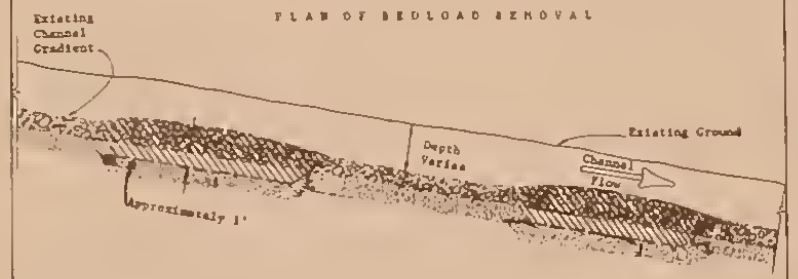
FIGURE 8

CHANNEL WORK

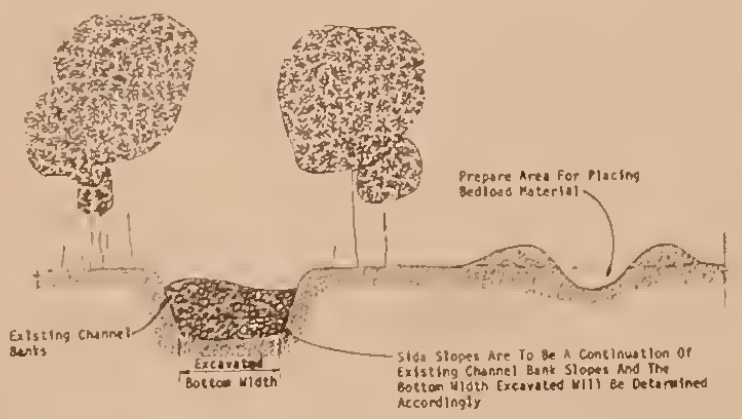
BEDLOAD REMOVAL



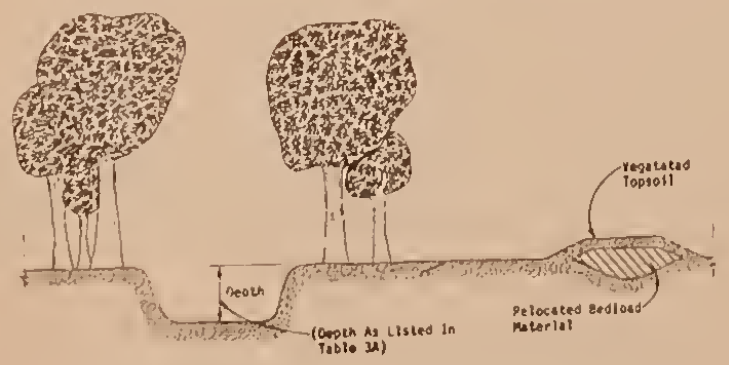
PLAN OF BEDLOAD REMOVAL



PROFILE ALONG ℄ OF CHANNEL REQUIRING BEDLOAD REMOVAL

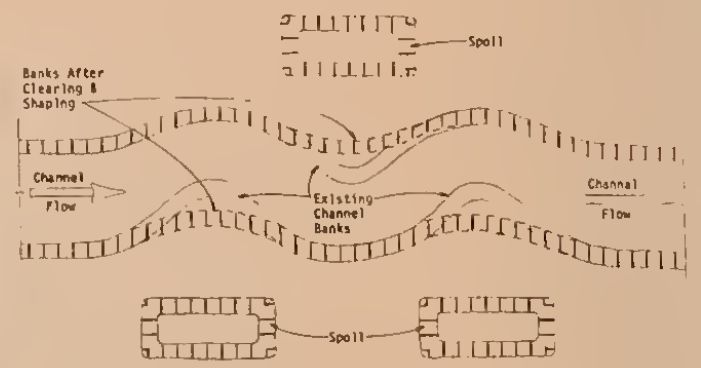


TYPICAL CROSS-SECTION WHERE BEDLOAD IS EXCAVATED



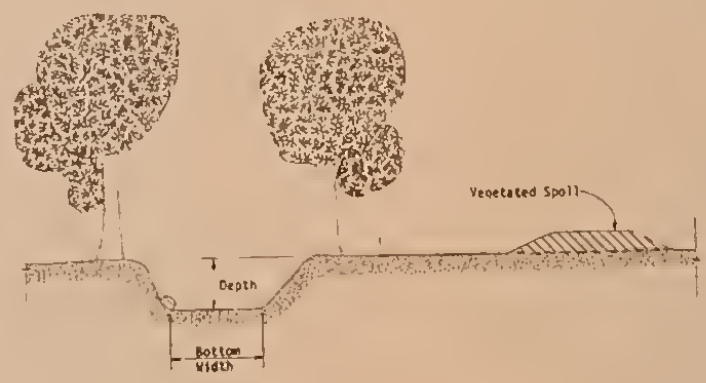
COMPLETED CROSS-SECTION OF BEDLOAD REMOVAL

CLEARING & SHAPING



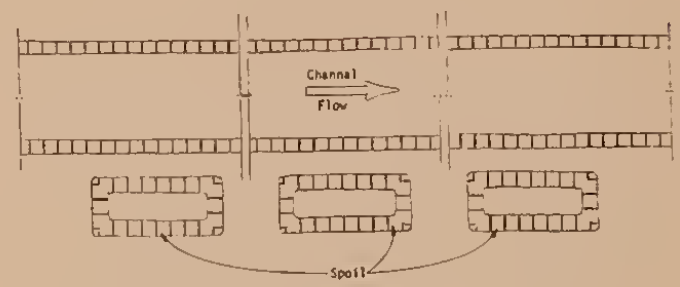
PLAN OF CLEARING & SHAPING

TYPICAL CROSS-SECTION REQUIRING CLEARING & SHAPING

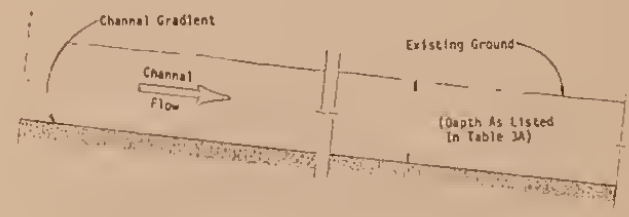


COMPLETED CROSS-SECTION OF CLEARING & SHAPING

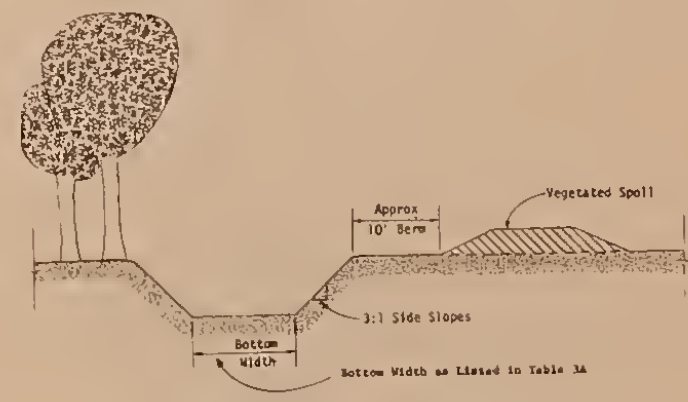
NEW CHANNEL EXCAVATION



PLAN OF NEW CHANNEL EXCAVATION



PROFILE ALONG ℄ OF NEW CHANNEL EXCAVATION



TYPICAL CROSS-SECTION OF COMPLETED NEW CHANNEL EXCAVATION

TYPICAL SECTIONS OF CHANNEL WORK

APPENDIX D FIGURE 9

FIGURE 10

VEGETATIVE COVER FOR STRUCTURAL MEASURES

CYPRESS CREEK WATERSHED

LAUDERDALE COUNTY, ALABAMA AND WAYNE COUNTY, TENNESSEE

Location	Season	Vegetation
Dams, emergency spillways, borrow areas*, and adjacent disturbed areas such as borders, etc.	Early spring to late summer	Common bermuda or Weeping love grass and Sericea lespedeza
Dams, emergency spillways borrow areas*, and adjacent disturbed areas such as borders, etc.	Fall	Tall fescue, White clover, Bermuda grass and Sericea lespedeza
Excavated channel side slopes, berms*, and spoil*.	Early spring to late summer	Common bermuda grass, Sericea lespedeza and Tall fescue
Disturbed channel side slopes, berms*, and spoil*.	Fall	Common bermuda grass, Sericea lespedeza and Tall fescue

*Trees, including pine and hardwood, will be planted at selected locations during fall and winter.

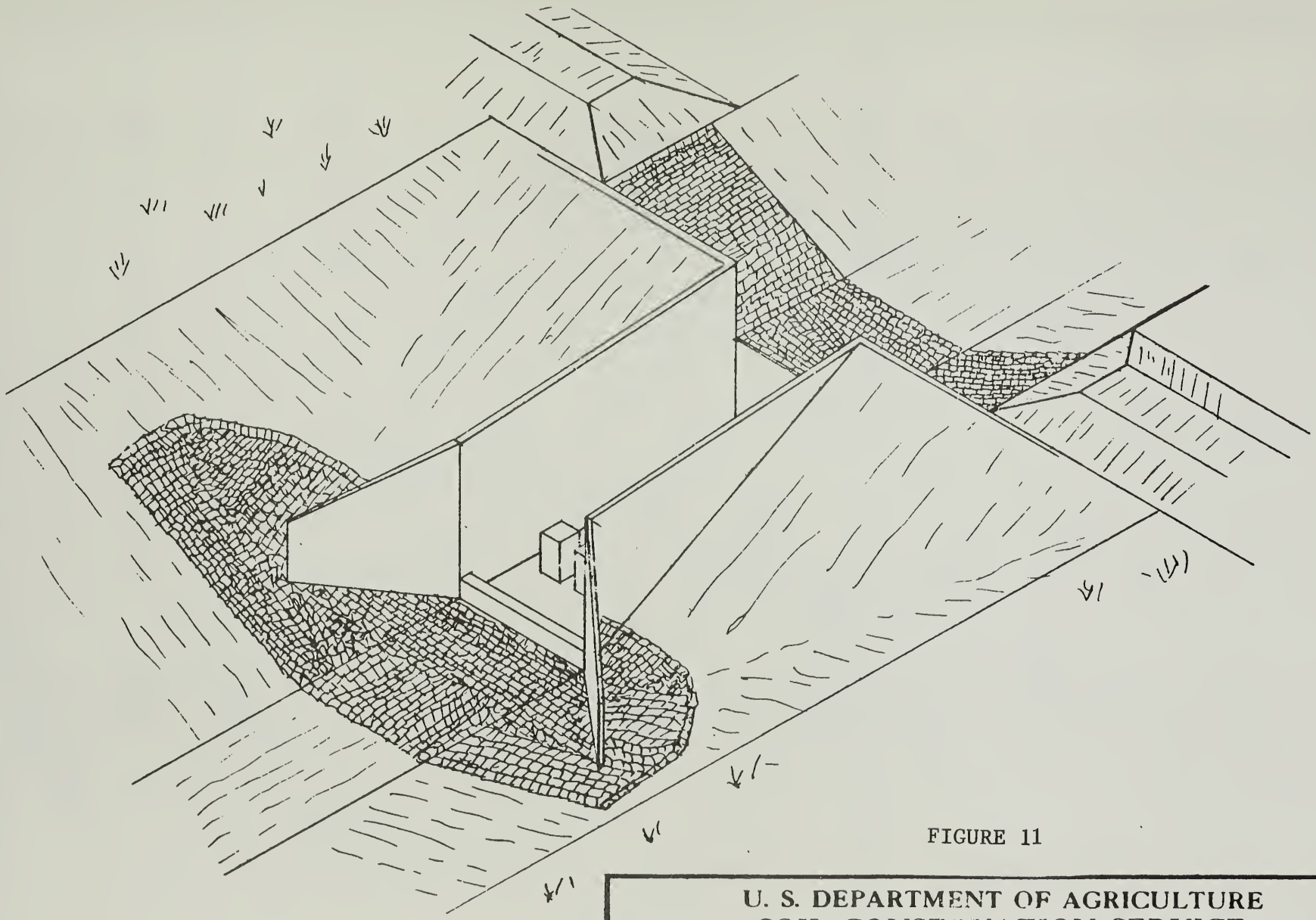
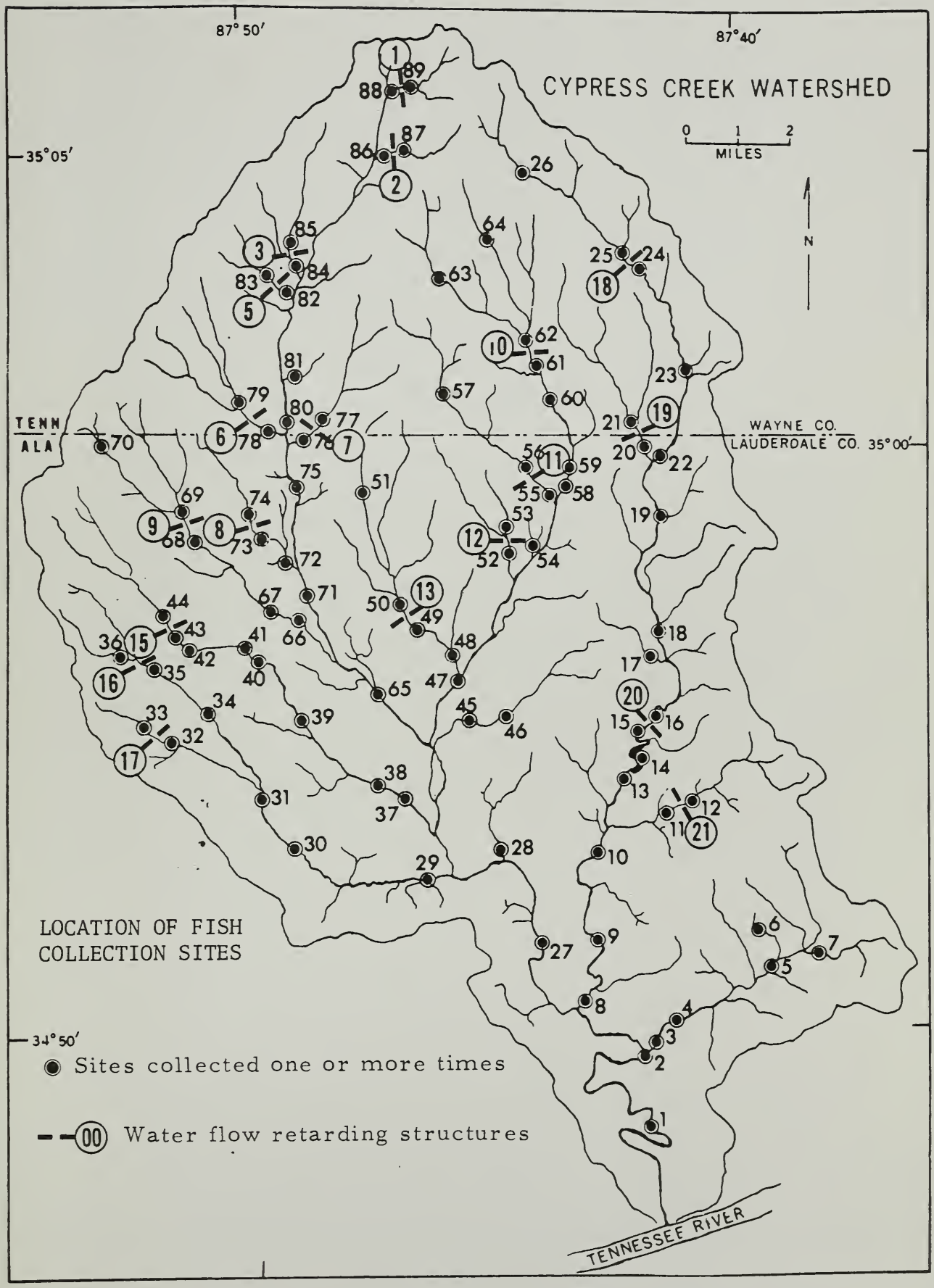


FIGURE 11

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TYPICAL REINFORCED CONCRETE

DROP SPILLWAY


87°50′
87°40′
CYPRESS CREEK WATERSHED
0 1 2
MILES
N
35°05′
TENN
ALA
WAYNE CO.
LAUDERDALE CO.
35°00′
34°50′
LOCATION OF FISH
COLLECTION SITES
Sites collected one or more times
Water flow retarding structures
TENNESSEE RIVER